CITY OF CAMBRIDGE
BICYCLE PLAN

TOWARD A BIKEABLE FUTURE

2015

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BICYCLE FRIENDLY COMMUNITY 2013-2017 GOLD THE LEAGUE OF AMERICAN BICYCLISTS

bikeleague.org/community

Bike Score 93

walkscore.com/MA/Cambridge

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CHAPTER 1

BACKGROUND, POLICIES, & GOALS

INTRODUCTION

Cambridge is a great place for people to bicycle, whether for a trip to the grocery store, a ride along the river, or a pleasant way to get to work. This can be seen in the large numbers of people who are out and about on a bike. Many days see multitudes of people using the bike facilities going to work or school on a weekday morning, or enjoying a family trip on a weekend.

There are many factors that contribute to Cambridge's bike friendliness. The compact nature of the city has helped to support the growth of bicycling in the city, as has the strong student population, dynamic workforce, and residents who choose Cambridge because of its livability. Cambridge's robust bicycle infrastructure is also responsible for the ever-increasing numbers. Many sections of Cambridge are well served by bicycle-friendly infrastructure, but there are still significant gaps and areas in need of improvement.

The Cambridge Bicycle Plan lays out a vision for where we as a city want to be. The fundamental guiding principle for this plan is to enable people of all ages and abilities to bicycle safely and comfortably throughout the city. This Plan provides the framework for developing a network of Complete Streets and supporting programs and policies that will help meet this goal.

Complete Streets are **streets for everyone. They are designed and operated to enable safe access for all users**, including pedestrians, bicyclists, motorists and transit riders **of all ages and abilities**. Complete Streets make it easy to cross the street, walk to shops, and bicycle to work.

POLICY CONTEXT

The Cambridge Bicycle Plan is supported by a set of local policies as well as policies at the regional, state and national level that promote bicycling.[1]

CAMBRIDGE BICYCLE POLICIES

- **Bicycling will be promoted as a form of transportation for people of all ages and abilities.**
- **Street design will be based on Complete Streets principles.**
- **Traffic safety education and enforcement will support bicycle safety.**
- **Facilities will be built to encourage more people of all ages and abilities to bicycle, and to better accommodate people currently riding.**
- **Bicycling conditions must be given careful consideration when improvements are made for other modes, to avoid adverse impacts and ensure safe bicycling conditions.**
- **Improvements for bicycling will be considered in all roadway projects undertaken in the city.**
- **New development projects will be designed and built to encourage users and occupants to access buildings by bicycle.**
- **Priority will be given to enable children to bicycle safely to school and other destinations through Safe Routes to School programs, bicycle education programs, and supportive infrastructure design.**

Note: A companion document, the Cambridge Pedestrian Plan,[2] provides the policies and design guidelines related to walking facilities.

CAMBRIDGE MUNICIPAL POLICIES

VEHICLE TRIP REDUCTION ORDINANCE

In 1992, Cambridge enacted the Vehicle Trip Reduction Ordinance[3] with a goal of making the city more livable by reducing automobile use and promoting non-polluting forms of transportation. The ordinance established the Bicycle and Pedestrian Mobility Program and a requirement to "design and implement a program to encourage

greater use of bicycles as alternatives to single-occupancy vehicles within the city." The ordinance also required the development of a Bicycle Plan and the implementation of a bicycle network.

GROWTH POLICY DOCUMENT

In 1993, the City of Cambridge published Cambridge Growth Policy Document: Toward a Sustainable Future.[4] Policy 23 states: "Encourage all reasonable forms of non-automobile travel including, for example, making improvements to the city's infrastructure which would promote bicycling and walking."

In 2007, the City published an update to this plan, which provides information about the progress that has been made in the years since the initial document was published, and reaffirms the commitment to supporting and enhancing sustainable transportation, including bicycling.

CLIMATE PROTECTION PLAN

In December 2002, the City Council adopted the Climate Protection Plan.[5] The plan set a goal of reducing greenhouse gas emissions by 20 percent below 1990 levels by 2010. Over 100 actions were proposed to achieve the goal. Among the specific actions identified:

"Improve facilities for walking and cycling. Install more bicycle lanes and parking facilities; create and improve off-road paths including railroad rights-of-way; expand efforts to retrofit streets and intersections to better accommodate bicycles and pedestrians."

Subsequently, in 2009, the Plan was amended with a set of interim recommendations noting that "reducing single-occupancy vehicle travel requires strong, coordinated action. Shifting trips to non-SOV modes, such as public transit, high-occupancy vehicles, bicycling, and walking reduces greenhouse gas emissions."

10.17.050 Bicycle and pedestrian mobility program.

The position of Bicycle and Pedestrian Coordinator is created within the Traffic and Parking Department. The City Manager shall, within one month of the effective date of this provision, designate the Bicycle and Pedestrian Coordinator. The Bicycle and Pedestrian Coordinator shall devote at least fifty percent of his/her time to carrying our the tasks required by this provision. The Bicycle and Pedestrian Coordinator shall, in conjunction with the Commuter Mobility Coordinator and the City's existing Bicycle Advisory Committee, (i) **design and implement a program to encourage greater use of bicycles as alternatives to single-occupancy vehicles within the city** and, (ii) focus the attention of the City on the needs of pedestrians. **The program will include, but is not limited to:**

A. Development of a Cambridge Bicycle Master Plan;

B. Development of a Cambridge Pedestrian Master Plan;

C. Development and evaluation of recommendations for a regional network of bicycle paths and bicycle priority streets favoring both bicycles and pedestrians;

D. Consultation with Cambridge residents, business, institutions and property owners;

E. Funding of bicycle amenities and storage facilities;

F. Funding for pedestrian amenities; and

G. Provision of bicycles for use by City police and Traffic and Parking Department. The program shall be funded at an initial level of twenty-five thousand dollars annually; these funds shall be in addition to, and not utilized for, the salary of the Bicycle and Pedestrian Coordinator. (Ord. 1139 (part), 1992)

Building development in Cambridge is subject to several requirements through the Zoning Ordinance[6] and the Parking and Transportation Demand Ordinance.[7]

ZONING ORDINANCE

For larger projects requiring a Special Permit, proponents must show that the project does not have an adverse impact on the bicycling environment, and may be required to mitigate impacts so that additional support of bicycling is provided. The ordinance states: "Development should be pedestrian and bicycle-friendly… Pedestrians and cyclists are able to access the site safely and conveniently; cyclists should have secure storage facilities conveniently located on-site and out of the weather. If bicycle parking is provided in a garage, special attention must be made to providing safe access to the facilities from the outside." Zoning ordinances are discussed in greater detail in Chapter 6.

PARKING AND TRANSPORTATION DEMAND MANAGEMENT ORDINANCE

Passed in 1998, the Parking and Transportation Demand Management (PTDM) Ordinance requires anyone adding vehicle parking spaces to commit to an approved plan to limit the number of single occupancy vehicle (SOV) trips going to a particular site. The approved plan must include specific ways the proponent will promote non-SOV travel and the projects will have ongoing monitoring to ensure compliance. People who ride bicycles benefit from this policy in several ways. Fewer vehicle trips being made within the city creates an easier environment for bicycle travel, and required improvements and programs promote and enhance bicycling. The PTDM ordinance is discussed in greater detail in Chapter 6.

"I cycle this stretch of road to go grocery shopping. The traffic is truly too fast! This whole area needs more separation and traffic calming."

SCHOOL WELLNESS POLICY

The Cambridge School Wellness Policy[8] outlines key goals that relate to promoting physical activity and active transportation to and from school for Cambridge Public School students:

"The Cambridge School Committee recognizes the relationship between student well-being, health and wellness and student achievement as well as the importance of a comprehensive district wellness policy. The School Committee is committed to protecting children's health, well-being and ability to learn to their fullest potential by supporting a school environment that promotes healthy choices and fosters lifelong habits with respect to eating and physical activity. Therefore the district has created this Wellness Policy including goals for nutrition, physical activity and physical education, and health and nutrition education. The Wellness Policy adheres to relevant state and federal regulation and is evidence based.

Students and staff will be encouraged to engage in active transportation (walking, bike riding, etc.) to and from school and to support a healthy and active lifestyle from an early age by working to make bicycling and walking to school a safer and more appealing mode of transportation."

CITY COUNCIL GOALS

The Cambridge City Council sets guiding goals that are updated from time to time. The current list of goals[9] contains several that are relevant to bicycling:

+ Promote a **Healthy Community and Environment** to advance Cambridge as a leader in public health and environmental sustainability.
+ Promote **Public Safety** and address the challenges and opportunities for multiple modes of transportation to safely share roads and sidewalks.
+ Foster **Community and Support Neighborhood Vitality**. Support opportunities for citizens to participate and to know each other within their neighborhoods and across the city.
+ Promote **Doing Business in Cambridge** and work to strengthen our mutually beneficial partnerships with businesses and universities.

REGIONAL POLICIES

Metropolitan Area Planning Council (MAPC) is the region's planning agency. Its stated policy is that it "supports, promotes and facilitates the increased use of bicycle transportation..... [and is] dedicated to helping local authorities plan, fund and implement projects that enhance bicycle transportation."

In 2007, the Regional Bicycle Plan[10] was published, which outlines the following Goals and Strategies for the greater Boston area, in which Cambridge is located:

+ **Encourage** more trips by bicycle in each community.
+ **Make** bicycling and bicycle accommodations a part of standard operating procedure.
+ **Improve** evaluation and prioritization of bicycle project proposals.
+ **Assist** and encourage local initiatives.
+ **Work** with state and federal agencies to simplify and coordinate funding programs.
+ **Increase** regional knowledge about bicycling.

STATE POLICIES

The Commonwealth of Massachusetts has developed a number of policies and initiatives that support and enhance bicycle transportation. Referenced here are the most relevant.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PROJECT DEVELOPMENT AND DESIGN GUIDE (2006)[11]

In this document, three Guiding Principles are laid out: Multimodal Consideration, Context-Sensitive Design, and a Clear Project Development Process. The document defines Multimodal Consideration as the following:

"To ensure that the safety and mobility of all users of the transportation system (pedestrians, cyclists and drivers) are considered equally through all phases of a project so that even the most vulnerable (e.g., children and the elderly) can feel and be safe within the public right of way."

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION GREENDOT POLICY,[12] JUNE 2010, UPDATED 2012 AND 2014

GreenDOT is the Massachusetts Department of Transportation's Comprehensive Sustainability Initiative. Through this initiative, policies for promoting and supporting bicycling are articulated.

Key goals:

- **Design** a multimodal transportation system.
- **Promote** healthy transportation and livable communities.
- **Triple** mode share of bicycling, transit and walking by 2030.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HEALTHY TRANSPORTATION POLICY DIRECTIVE, SEPTEMBER 9, 2013

"All MassDOT funded and/or designed projects shall seek to increase and encourage more pedestrian, bicycle and transit trips. MassDOT has established a statewide mode shift goal that seeks to triple the distance traveled by walking, bicycling and transit by 2030, promoting intermodal access to the maximum extent feasible will help the agency meet this goal."[13]

FEDERAL POLICIES

Bicycle transportation is supported at the federal level by the United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation, March 2010:[14]

"The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes."

More information and details on federal policies and programs can be found here.

PLAN VISION, GOALS & TARGETS

VISION

Bicycling is an important component of Cambridge's transportation system. Cantabrigians envision the day when they will be able to bicycle safely and comfortably to all destinations within the city. Streets and roads will be well designed to accommodate bicycling as a mode of transportation for people of all ages and abilities.

GOALS

1. Make a significant shift towards bicycling as a sustainable transportation mode
2. Create a transportation system that is safe for users of all ages and abilities
3. Innovate and be an early adopter of best practices in bicycle infrastructure

TARGETS

- (A) By 2020, 10% of all trips in Cambridge will be made by bicycle
- (B) By 2030, 20% of all trips in Cambridge will be made by bicycle
- (C) By 2020, the percentage of children walking and bicycling to school will increase 20% over 2015 numbers
- (D) Crash rates will continue to decrease with a goal of zero fatalities or serious injuries by 2020
- (E) All streets will be bicycle friendly
- (F) New facilities are prioritized based on the Bicycle Network Vision

DEVELOPING THE VISION

Cambridge's high-quality bicycle infrastructure and programs have made it one of the most bicycle-friendly cities in the country. Its large and passionate bicycling community was an invaluable resource to developing the Cambridge Bicycle Plan and Bicycle Network Vision, providing information on the experience and needs of those who know local biking conditions best. This plan reflects the many voices of those who live, work and travel in Cambridge and who participated in the process at on many levels.

In order to develop a network that will provide safe and convenient biking options for people of all ages and abilities, the planning team conducted a variety of activities listed below to gather input from the public, assess existing biking conditions in the city, and ultimately develop a Bicycle Network Vision.

ONLINE SURVEYS

To understand what users want, the City developed a survey asking about their bicycle travel, what bicycle facilities were preferred, and information about children riding. The survey was taken by 733 people. Details on the survey results may be found in Chapter 3.

STREET TEAMS

In 2013-14, staff and volunteers collected comments at various venues throughout the city, using paper maps. Initiated by the Cambridge Bicycle Committee, this proved a popular way for people to voice their particular concerns, and resulted in about two dozen maps full of hundreds of comments.

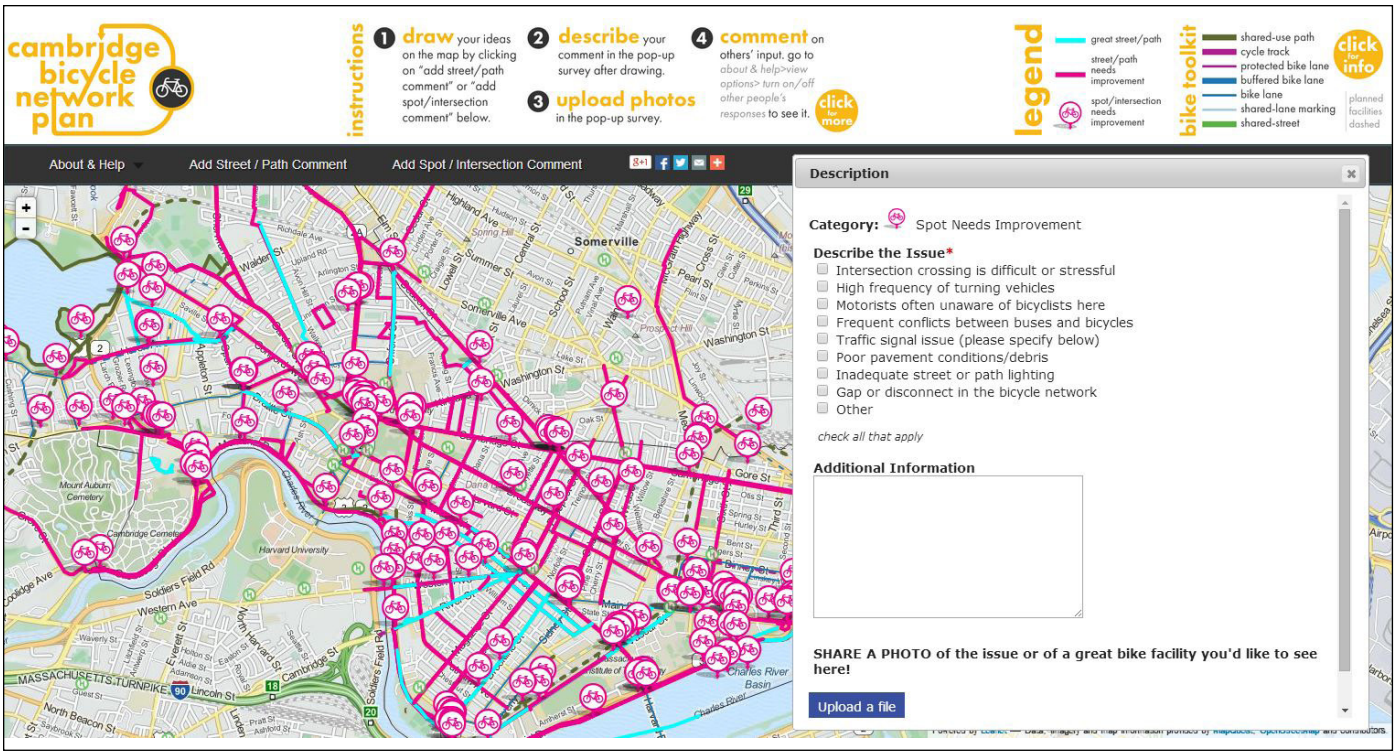
cambridge bicycle network plan
instructions
1 draw your ideas on the map by clicking on "add street/path comment" or "add spot/intersection comment" below.
2 describe your comment in the pop-up survey after drawing.
3 upload photos in the pop-up survey.
4 comment on others' input. go to about & help>view options> turn on/off other people's responses to see it.
click for more
legend
great street/path
street/path needs improvement
spot/intersection needs improvement
bike toolkit
shared-use path
cycle track
protected bike lane
buffered bike lane
bike lane
shared-lane marking
shared-street
click for info
planned facilities dashed
About & Help
Add Street / Path Comment
Add Spot / Intersection Comment
Description
Category: Spot Needs Improvement
Describe the Issue*
Intersection crossing is difficult or stressful
High frequency of turning vehicles
Motorists often unaware of bicyclists here
Frequent conflicts between buses and bicycles
Traffic signal issue (please specify below)
Poor pavement conditions/debris
Inadequate street or path lighting
Gap or disconnect in the bicycle network
Other
check all that apply
Additional Information
SHARE A PHOTO of the issue or of a great bike facility you'd like to see here!
Upload a file
Somerville
Cambridge
Harvard University
Mount Auburn Cemetery
Cambridge Cemetery
Charles River Basin
MASSACHUSETTS TURNPIKE

Figure 1.1: Screenshot of WikiMap #1

WIKIMAP #1

In June 2014, an online WikiMap was launched to collect place-based comments on biking conditions in Cambridge (Figure 1.1). Users were asked to indicate streets or paths in the city where they enjoy biking as well as streets, paths, or intersections that are in need of improvement. 995 unique comments were collected from WikiMap users over the course of several months.

BICYCLE COUNT DATA ASSESSMENT

Data from biannual counts at 17 different locations throughout the city were mapped and analyzed to determine areas of greatest bicycling activity in the city. Staff extrapolated count data to determine the bicycling rates on key corridors (described more in Chapter 3).

BICYCLE CRASH DATA ASSESSMENT

Utilizing extensive and detailed data from the Cambridge Police Department, crashes involving bicyclists throughout the city from 2008-2012 were analyzed. Crash data provided insight on broad scale trends such as where bicycle crashes occurred with the highest frequency and what types of crashes occur commonly in specific locations (described more Chapter 3).

BICYCLE LEVEL OF COMFORT ANALYSIS

The Cambridge Bicycle Level of Comfort (BLC) Analysis is a planning tool used to quantify the level of comfort that an average bicyclist is likely to perceive while riding on any road or path. This analysis utilized an array of data about the physical and operational characteristics of all streets in

the city to assign a Level of Comfort ranking. Vetted multiple times by City staff and residents, the analysis fed directly into the development of network plan recommendations.

PUBLIC MEETING #1

In addition to public comments gathered through online surveys, online WikiMaps, and myriad comments collected on paper maps at bike-related events, the City held two public open house events during the bike plan update process. The first, held at the Cambridge Public Library on June 12, 2014, was aimed at collecting public knowledge about existing bicycling conditions in the City including a chance to review and comment on the crash data analysis, the BLC, and the existing bicycle network.

BICYCLE NETWORK VISION

Based on public input from the survey and WikiMap, BLC, and crash and count data, the planning team developed a Bicycle Network Vision (BNV). The BNV is a network of streets and paths where high-comfort bicycle infrastructure should be prioritized in order to provide seamless connections by bike for people of all ages and abilities between important destinations. The BNV recommends three different levels of accommodation for bicyclists including off-street paths, increased separation, and reduced speed/volume, depending on roadway and land use characteristics. Although the City considers all streets to be part of a greater bike network, the BNV's goal is to identify and prioritize streets where infrastructure improvements would provide the greatest benefit for creating a network for people of all ages and abilities.

WIKIMAP #2

In the fall of 2014, following the creation of the Draft BNV, people were asked for their input on the recommended network. The WikiMap asked users to rank the importance of any street or path in the Draft BNV as well as to draw in any missing connections in the plan. During the 5 week comment period, 214 comments were collected and reviewed in order to further refine network plan recommendations.

PUBLIC MEETING #2

The second public meeting was held at Cambridge Community College on December 4, 2014. Over 100 members of the community attended this event to review and comment on the Draft BNV and to provide additional input on the existing conditions analyses presented at the first open house. Input gathered during this meeting was compiled and reviewed to make further revisions to the Draft BNV.

TOWARDS A BIKEABLE FUTURE

The 2015 Bicycle Plan: Toward a Bikeable Future describes current efforts and programs to promote bicycling in Cambridge, and lays out a framework for the future. It is intended to be a living document, with annual updates on the progress made towards implementing policies and projects, and laying out new priorities. It will serve as a reference for information and a guide for how we envision our future as a city where people of all ages and abilities feel safe and comfortable riding a bike.

HOW THE BICYCLE NETWORK VISION WILL BE USED

The Bicycle Network Vision creates an aspirational concept for a complete system, enabling people of all ages and abilities to travel more safely and comfortably throughout the city. It is intended to be used as a guide and reference for long, medium, and short term infrastructure projects undertaken in the city including projects that are part of the City's Five Year Plan for Street & Sidewalk Reconstruction.

As each street is evaluated for improvements, these components will be taken into consideration, with an emphasis on the overall public policies and goals as referenced earlier in this chapter, and with attention given to public input. The overarching guidance will continue to be in creating Complete Streets, ensuring that they are designed and operated to enable safe access for all users, while enhancing mobility for sustainable transportation modes.

MULTIMODAL APPROACH

The streets and sidewalks of Cambridge represent the greatest resource of public space in the city. People use them not only for traveling along, but also for "staying" activities such as sitting on benches or enjoying sidewalk cafes, and the spaces are used for green infrastructure including trees, planting areas and stormwater management. Space is also used for parking automobiles and bicycles as well as for infrastructure that supports transit use, such as bus stops, shelters and subway entrances.

FIVE YEAR PLAN FOR STREET & SIDEWALK RECONSTRUCTION

The Department of Public Works maintains a Five Year Sidewalk and Street Reconstruction Plan that identifies the streets and sidewalks that are anticipated to be reconstructed each year for the next 5 years. The plan can be found here:

https://www.cambridgema.gov/theworks/ourservices/engineering/aboutengineering/

GOALS OF THE 5 YEAR PLAN:

- **Reconstruct streets, sidewalks and bicycle facilities with an emphasis on a Complete Streets approach: designing the street for all users**
- **Provide for comprehensive inspection/repair and upgrading of City utilities, as well as public utilities, so as to ensure new street system integrity is maintained for as long as possible once construction is complete**
- **Maintain safe, accessible streets and sidewalks**
- **Reconstruct streets, sidewalks and bicycle facilities in a prioritized fashion based on need**
- **Construct projects efficiently with minimum disruption to community life**
- **Effectively communicate design and construction projects with neighborhoods and facilitate a more integrated design process**
- **Provide reasonable access for all users, during street reconstruction**

The Bicycle Network Vision will be used as an overlay to this Plan, in order to identify and prioritize areas with non-existent or inadequate bicycle facilities, particularly where reconstruction could improve connectivity and route continuity for people who bicycle.

STREET REDESIGN PROCESSES

Street reconstruction projects look at how improvements can be made for all users, with a complete streets emphasis, to enable people of all ages and abilities to travel safely. All projects ensure accessibility with reference to the Americans with Disabilities (ADA) and Massachusetts Architectural Access Board (AAB) standards.

Major projects include a public participation process, where public input is given on how specific street designs can best meet the City's policies and the community's goals. Residents and users are encouraged to participate in these opportunities, which are announced through mailings, direct flyering, and City website and social media outlets.

PRIVATE DEVELOPMENT INFRASTRUCTURE IMPROVEMENTS AND MITIGATION MEASURES

Infrastructure improvements are often made in connection with private development projects, particularly for larger projects. For many larger projects, mitigation requirements are part of the project permitting process. These improvements and requirements should be made with reference to the Bicycle Network Vision.

ENDNOTES

1 See Appendix A for a broader set of policy references.

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CHAPTER 2

BICYCLE TRANSPORTATION

BICYCLING IN AMERICA

Bicycles gained prominence as transportation vehicles in the late 19th century. In the United States, many early efforts to improve road conditions were sponsored by organizations such as the League of American Bicyclists. After the rise in popularity of the automobile, the situation changed rapidly, with motor vehicles dominating the country's roadway infrastructure; bicycles were not taken into consideration in the development of the transportation infrastructure for much of the 20th century.

In the 1960s, more people started using bicycles for both transportation and recreation, and many off-road bike paths were developed throughout the 1970s. However, paths alone do not meet all the travel needs of people who bike. Because it is our road system that provides the most efficient – and often the only – connections between destinations, the City of Cambridge supports the premise that roadways should accommodate all users and that revisions to the layout and function of many streets will be required to ensure support for bicycling.

Bicycles are found in most American households, with an average of 0.86 adult-size bicycle per household.[1] In 2012, 13.0 million bicycles were sold in the U.S. (12.2 million new cars and trucks were purchased that year).[2] The bicycle industry has a positive robust economic benefit: in 2012, the bicycle industry in the U.S. was estimated to support 772,146 jobs and generate nearly $10.7 billion in federal, state and local taxes.[3]

THE BENEFITS OF BICYCLING

Bicycling is energy efficient, convenient, and improves health and quality of life, among many other benefits. This section explores a few of these benefits. For further information, refer to the references section.

ENERGY EFFICIENCY

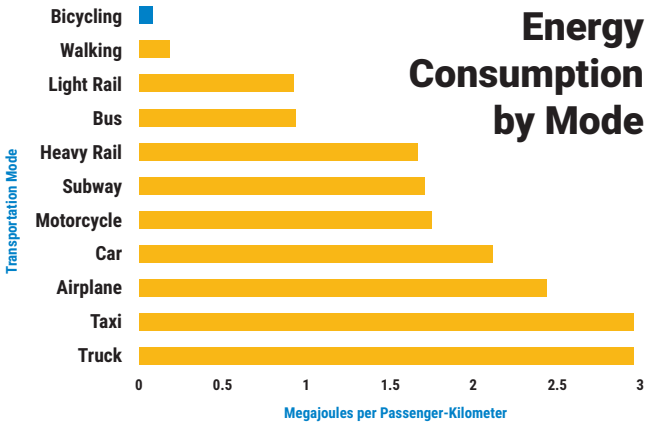


Figure 2.1: Energy consumption by mode. Bicycling is the most energy efficient form of transportation, getting the energy equivalent of over 1,000 miles per gallon.[4] [5]

ENVIRONMENTAL BENEFITS

Using a bicycle instead of other modes of transportation will have positive impacts:[6]

+ Reduced greenhouse gas emissions and lower contribution to global climate change
+ Reduction in pollutants related to air quality
+ Reduction in pollutants that are related to ancillary facilities; the manufacturing of automobiles contributes more pollution than the manufacture of bicycles

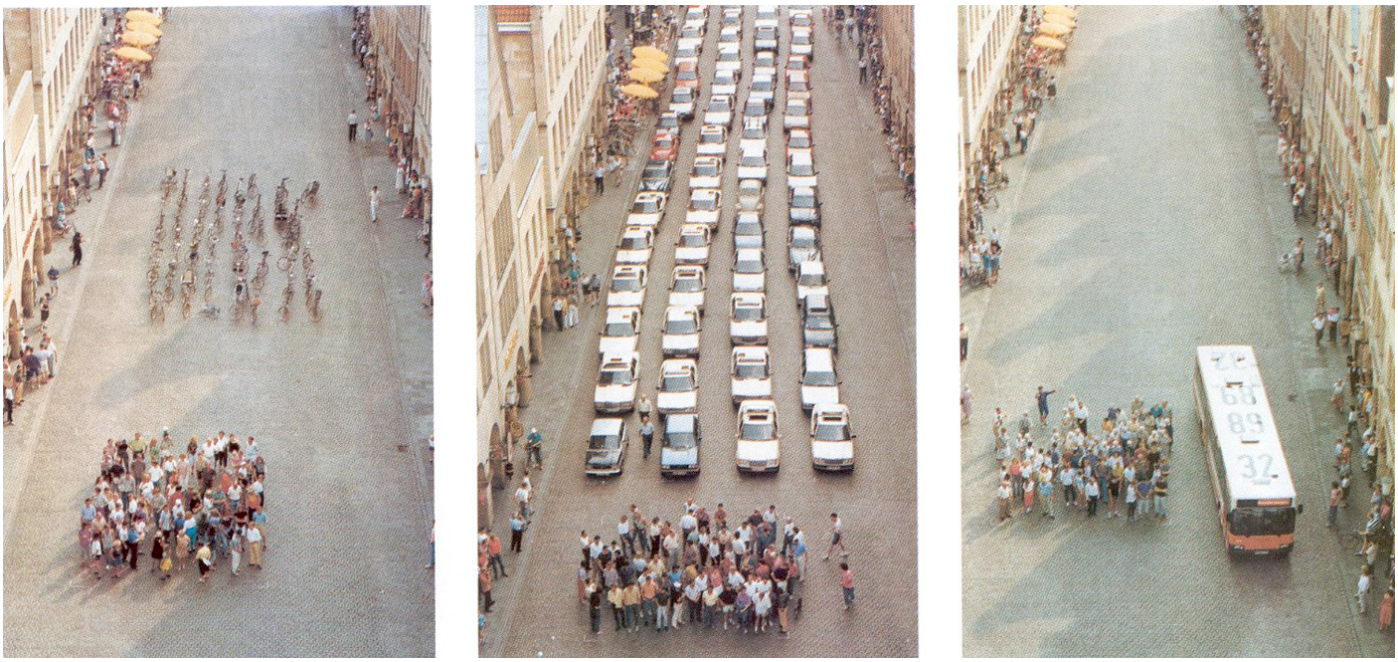


Figure 2.2: Relative space for different travel modes. In this influential photo, the City of Münster, Germany demonstrates the relative space required to move the same number of people by bicycle, car and bus.[7]

TRANSPORTATION INFRASTRUCTURE BENEFITS OF INCREASED CYCLING

+ Less traffic congestion
+ Greater efficiency: more people can travel in less space
+ Less wear and tear on our roads
+ Less consumption of petroleum resources
+ Fewer costly crashes and property damage
+ Less need for additional roads, travel lanes, and parking areas

HEALTH BENEFITS[8]

+ Reduced air and noise pollution for everyone.
+ Improved health and well-being through regular exercise. Numerous studies have shown a positive link between exercise and health in a wide range of areas, notably cardiovascular health, weight control, mental health, cholesterol, hypertension, stress, and other diseases.
+ Providing regular exercise opportunities for children. Children need a lot of movement for their physical and mental well-being. With school systems reducing time for recess and physical education and parents more reluctant to allow their children to play freely outside, U.S. children get less exercise now than they did 20 years ago. At the same time, there has been a rise in childhood obesity and related diseases like Type 2 diabetes. In addition, lack of physical activity has been associated with ADD-type behavior.
+ Even after adjustment for other risk factors, including leisure time physical activity, those who did not bicycle to work experienced a 39% higher mortality rate than those who did.[9]

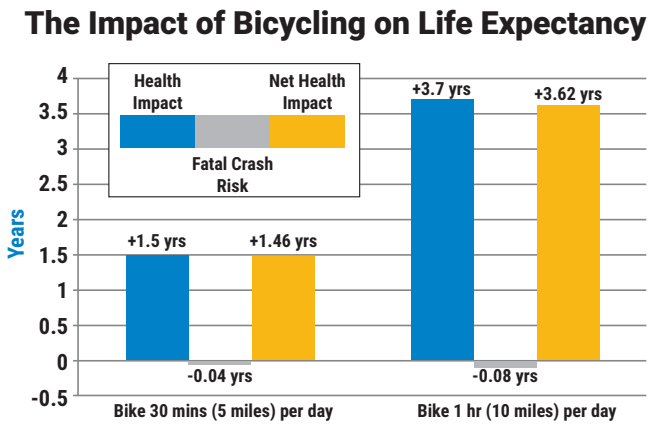


Figure 2.3: Bicycling has positive impacts on life expectancy, even with crash risk factored in.[10]

+ People who bicycle to work are healthier, with fewer sick days per year.[11]

+ On average, the estimated health benefits of bicycling are substantially larger than the risks of bicycling relative to car driving. The benefits to society are even larger because of a reduction in air pollution and eventually — with more bicycling, less driving, and better street design — fewer traffic crashes.[12]

ECONOMIC BENEFITS

+ Bicycling is a low-cost means of transportation that is available to many people regardless of income or age. Estimates of annual costs range from less than $100 to around $300 annually for a modest style bicycle (annualized over 10 years).[13]

+ Even less expensive is a Hubway membership, at $85/year or about $7/month (2015). Estimates for car ownership at this time are about $6,700 - $10,600/year.[14]

+ A quality bicycling environment creates opportunities for people to participate in the social, cultural, and economic life of the community without using a car.

+ When people use bicycles instead of driving, the public saves money on roadway maintenance and other traffic-related services.[16] In Cambridge, approximately a third of households have no car.[15]

+ Retailers benefit from residents who, with easy access to goods, make their purchases locally. The "Buy Local" movement is a strong, growing movement in Cambridge and around the country.

+ Evidence from around the country shows that bicycle or multi-use paths foster new and expanded business.[17]

+ Tourism is an important industry, and a bicycle-friendly environment can attract many riders from elsewhere. A bicycle-friendly environment also allows and encourages tourists to bike as a means of transportation when visiting.

+ Cities with higher bicycling populations have been shown to have lower overall crash rates, which in turn reduces related costs, such as for police, medical care, and insurance.[18] [19] [20]

+ Greater reliance on bicycling and other sustainable transportation modes enables economic growth on a large scale. The Kendall Square area of Cambridge added 4.6 million square feet in a decade and increased commercial and institutional space by 40 percent without a concomitant rise in automobile traffic.

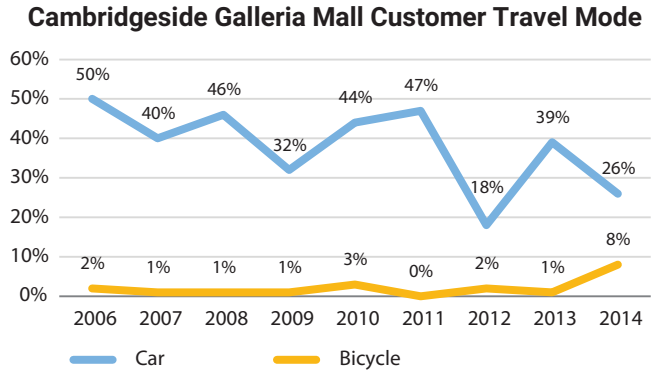


Figure 2.4: Fewer shoppers use cars to reach the Cambridgeside Galleria.[21]

QUALITY OF LIFE AND SOCIAL BENEFITS

The number of people who feel comfortable walking or riding bicycles is a measure of the quality of life in a city. The presence of many people walking and bicycling in a city indicates that there is a strong sense of community, people feel safe being outdoors, social interactions can occur openly, and people of all ages and incomes can have access to public and private facilities.

Safe bikeways help enable school children to bike to school, providing children with much-needed physical activity and reducing the need for busing or automobile trips by parents. Children in cities such as Cambridge are often more mobile than suburban children because they can get around more easily on foot, by bicycle, or by transit. Children who walk and bicycle to school do better academically.[22] [23]

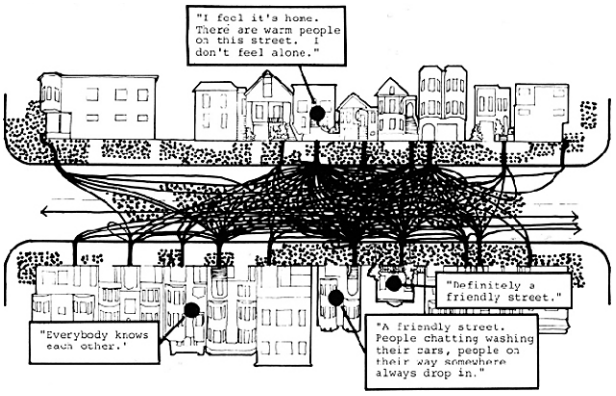
Traffic has a profound impact on community life. A renowned study by University of California, Berkeley professor Donald Appleyard compared three residential streets in San Francisco that were similar except for traffic levels. Published in the influential book "*Livable Streets*," the research showed that residents of the street with the lightest traffic volumes reported having the highest average number of friends and acquaintances on their street when compared to residents of the streets with higher traffic volumes (see Figure 2.5).[24]

Comparison of Social Connections on Streets with Light, Moderate and High Traffic Volumes

Light Traffic

2,000 Vehicles per Day
200 vehicles per peah hour

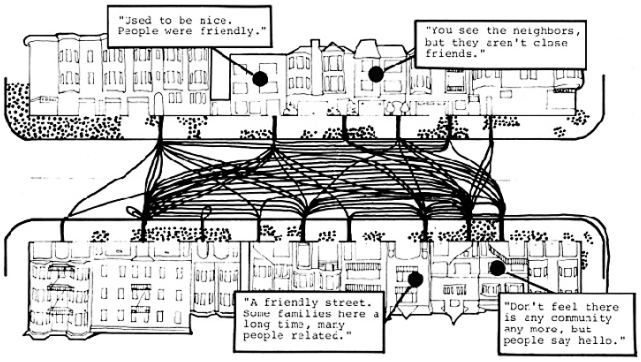
3.0 friends per person
6.3 acquaintances


"I feel it's home. There are warm people on this street. I don't feel alone."
"Definitely a friendly street."
"Everybody knows each other."
"A friendly street. People chatting washing their cars, people on their way somewhere always drop in."

Moderate Traffic

8,000 vehicles per day
550 vehicles per peak hour

1.3 friends per person
4.1 acquaintances


"Used to be nice. People were friendly."
"You see the neighbors, but they aren't close friends."
"A friendly street. Some families here a long time, many people related."
"Don't feel there is any community any more, but people say hello."

Heavy Traffic

16,000 vehicles per day
1,900 during peak hour

0.9 friends per person
3.1 acquaintances

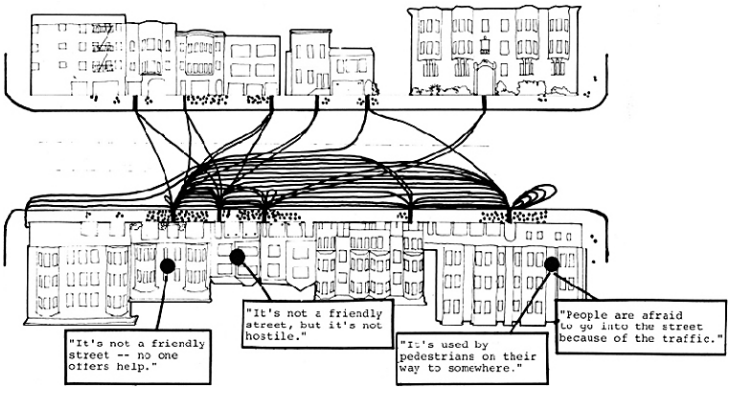

"It's not a friendly street -- no one offers help."
"It's not a friendly street, but it's not hostile."
"It's used by pedestrians on their way to somewhere."
"People are afraid to go into the street because of the traffic."

Figure 2.5: Comparison of social connections on streets with light, moderate and high traffic volumes. Lines on the diagram represent social connections. Adapted from the original illustration created by Betty Drake in "*Livable Streets*" and used with permission from Bruce Appleyard.

THE POTENTIAL FOR BICYCLING

Bicycling is an enormously popular activity. In 2009, Americans ages 6 and older went on 2.54 billion bicycling outings, averaging 59 outings per person who rode a bike.[25] People use a bicycle for all sorts of reasons, not just for commuting. Commute trips in general make up less than 20% of all trips.[26] Bicycling gets people to work, to school, to shops, to visit friends, to parks, to soccer practice, to music lessons, to the T, or to see the sights.

MAJOR REASONS PEOPLE BICYCLE

- Primary mode of transportation
- More convenient or faster than other modes of transportation
- Recreation/pleasure
- Fitness
- An activity to do with family or friends
- Concern for the environment
- Less expensive than other modes of transportation
- Many trips are within easy bicycling distance: 40% of all trips nationwide are shorter than two miles, no more than a 10-minute bike ride.[27]
- Any combination of the above

DESIRE AND SUPPORT FOR BICYCLING

In many parts of the country there are structural deficiencies in the environment that pose major obstacles to increasing the rate of bicycling and walking, such as sprawling development and highways that dissect communities. Fortunately, Cambridge already has many of the key elements to support bicycling and walking: compact, with many destinations in close proximity.

No matter where one is, though, numerous studies over decades have shown that:

1. **Most people in the US would like to bicycle more than they do now**
2. **The biggest barrier to bicycling is the lack of safe facilities. More and better bicycling facilities have dramatically increased bicycle share trips in cities without any tradition of cycling for daily travel.[28]**

People also consistently articulate their support for public spending on providing better facilities. In a 2014 survey of US voters, three-quarters wanted to see the level of funding for bicycling and walking facilities maintained or increased.[29]

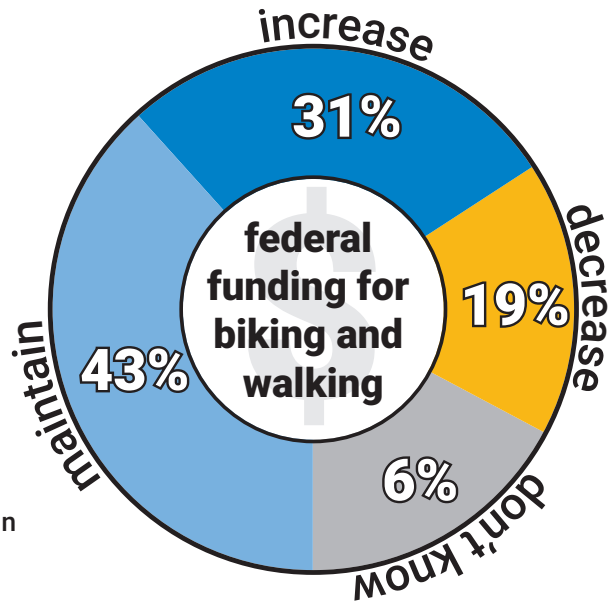


Figure 2.6: 74% of Americans polled want to maintain or increase federal funding for biking and walking.[29]

HOW PEOPLE RELATE TO BICYCLING

In 2006, the City of Portland, OR's Office of Transportation proposed a typology describing differences in the way people relate to riding a bicycle: "Strong and Fearless, Enthused and Confident, Interested but Concerned, and No Way No How".[30]

These categories are in part determined by one's comfort riding a bicycle on different types of bikeways. "Strong and Fearless" bicyclists will ride "regardless of roadway conditions." "Enthused and Confident" people are comfortable riding on a road with automobiles, but prefer to do so operating on bicycle-specific facilities and appreciate efforts made to improve the bikeway infrastructure. "Interested but Concerned" people like to ride on off-road paths or quiet neighborhood streets, but are afraid to do so on most roads and therefore do not regularly ride. Finally, the "No Way No How" people are expected not to be interested in riding a bicycle, "for reasons of topography, inability, or simply a complete and utter lack of interest."

Follow-up research conducted by Portland State University in 2012 indicated that nearly all of the sampled population (908 adults) studied in Portland, OR fit into one of the four categories in a similar proportion. The research found that 56% of the region's population was categorized as "Interested but Concerned," which is considered to be the target market for increasing bicycling for transportation; this population reported the highest level of comfort on separated paths and quiet residential streets, closely followed by riding in separated bike lanes on busy streets (30 to 40 mph), a dramatic improvement over the comfort level reported for striped bicycle lanes or riding in mixed traffic without a facility. The analysis indicated that reducing traffic speeds and increasing separation between bicycles and motor vehicles increases levels of comfort and bicycling rates.

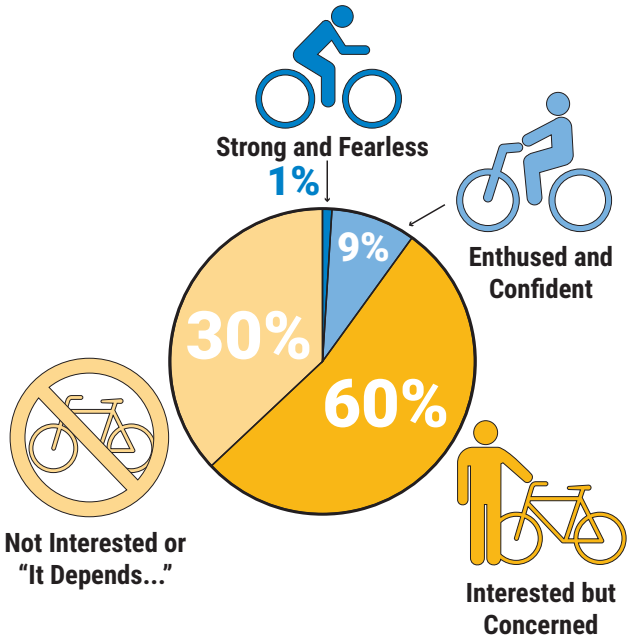


Figure 2.7: Bicyclist Types and Proportions

In the same study, women and the elderly were underrepresented among the more confident adults and those who currently ride bicycle for transportation. Particularly telling was the finding that survey respondents who are categorized as "no way no how" reported that they would feel "comfortable or very comfortable" with a separate bicycle facility.[31] Therefore, the category of "no way no how " needs to be changed; we are calling this group the "Maybe, it depends" group.

The vast majority of people do want to ride, at least sometimes, and supporting everyone who is interested in riding is one of the primary goals of the Cambridge Bicycle Plan.

WHAT IS NEEDED TO SUPPORT PEOPLE OF ALL AGES AND ABILITIES?

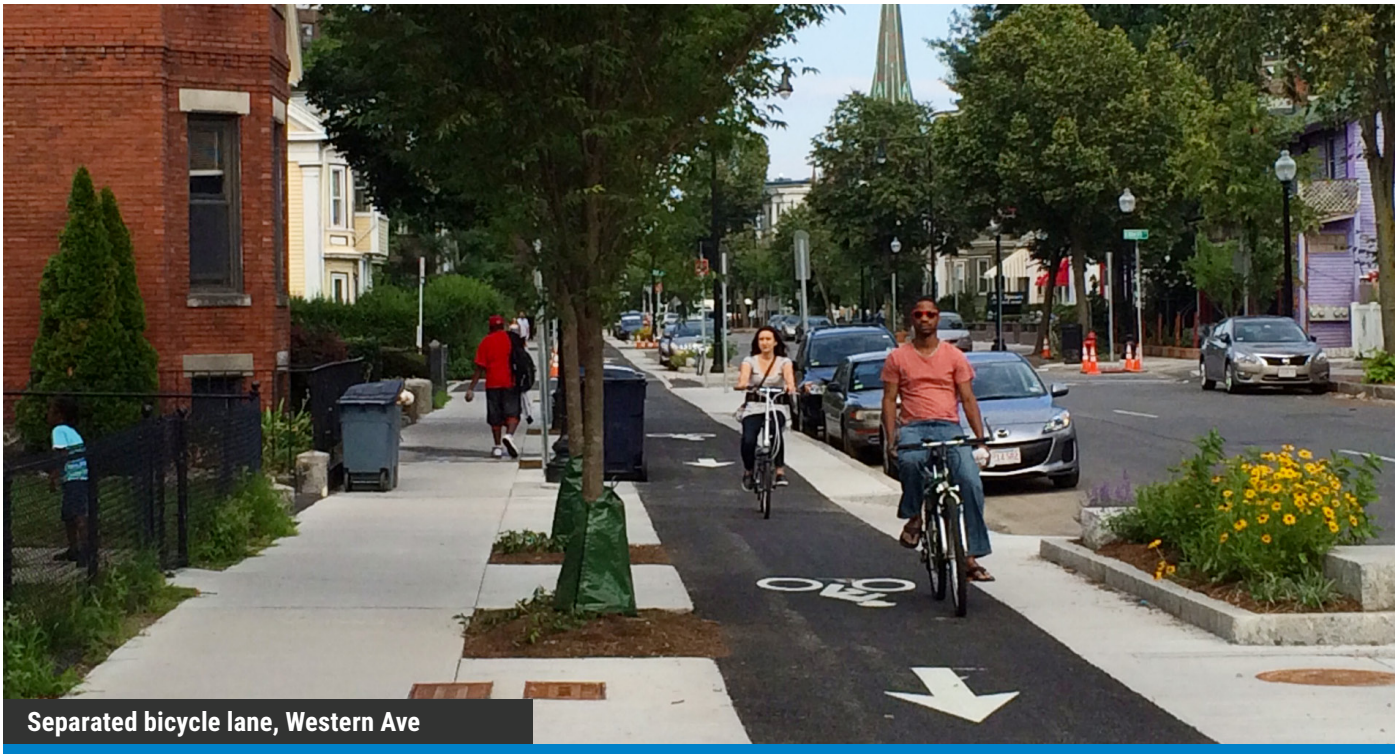
INCREASE SAFETY, COMFORT AND SEPARATION

Since Cambridge began planning for bicycle transportation in earnest in the 1990s, we have consistently seen that the greatest impact comes from creating facilities: people ride where there are places for them to ride.

Many studies conducted locally and across the country have clearly demonstrated that the most significant increases in bicycling rates happen when people are provided with safe, direct, low-stress facilities. Multi-use paths and quiet streets make up an important part of the low-stress bicycle network, but most trips will require some travel along a major street. Therefore, on major streets (arterials and major collector streets), the ideal facility type is a "separated bike lane" (also known as "protected bike lanes" and "cycle tracks").

Separated bike lanes provide an exclusive space for people to ride that is separated from motor vehicle and pedestrian traffic by a vertical element, which can include plastic flexposts, parked cars, curbs, grade separation, and/or landscaping.

Standard bicycle lane, Hampshire Street



Separated bicycle lane, Western Ave

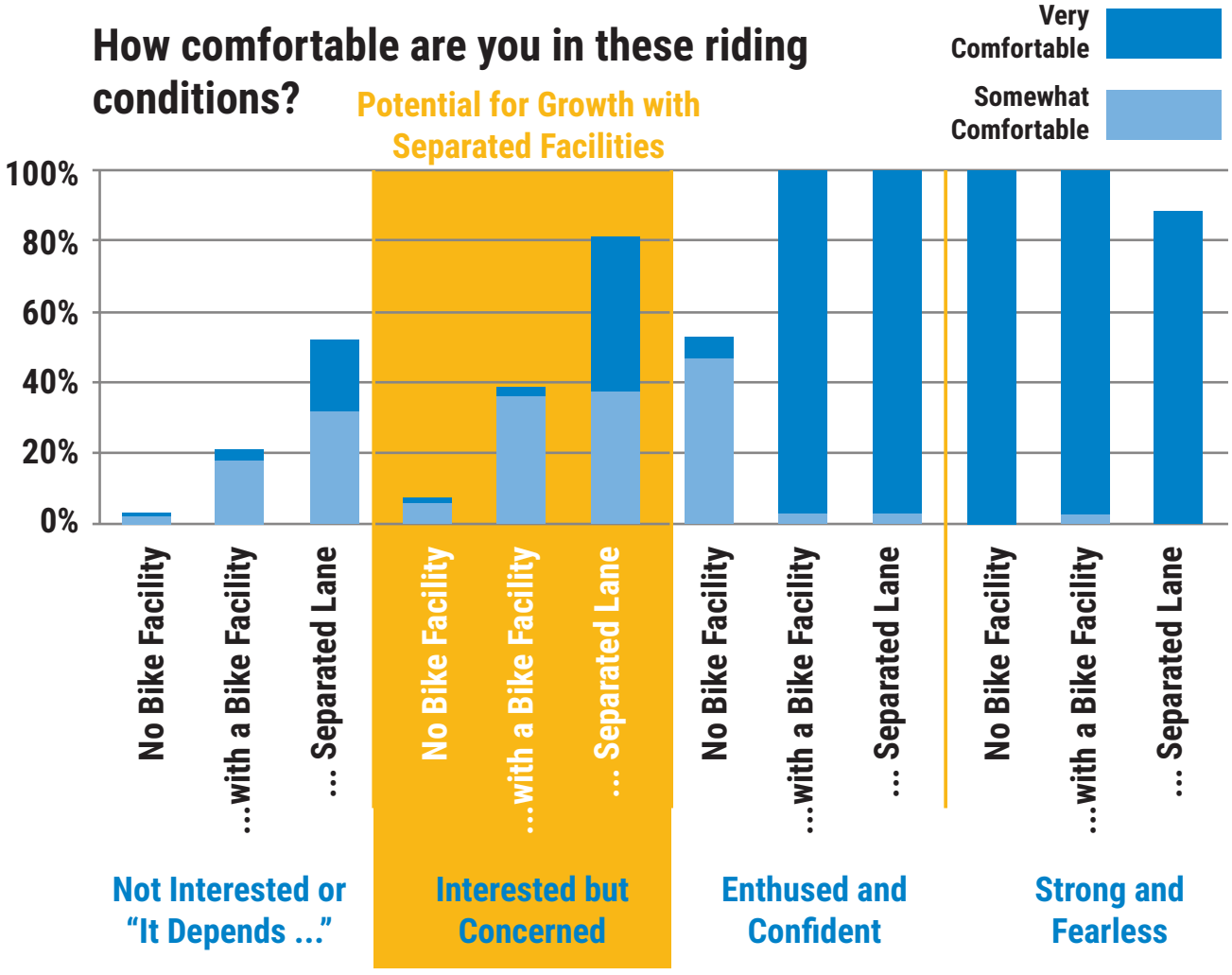
Transitive benefit: more protected facilities > more riders > greater safety

BENEFITS OF SEPARATED BICYCLE LANES:[32]

- + Separated bicycle facilities have been shown to have significant safety benefits
- + Separated bicycle facilities are most comfortable and the preferred facility type on major roads for the vast majority of users
- + Where separated bicycle facilities have been established, marked increases in the number of people riding has been demonstrated
- + Where separated bicycle facilities have been established, there is a dramatic decrease in sidewalk bicycling, thereby improving pedestrian comfort[33]

Separated bicycle lanes enhance the comfort and safety of bicycling on urban streets and encourage people of all ages and abilities to ride.

In a study conducted in Portland, OR, air quality was found to be 8% to 38% better in a separated bike lane than a standard bicycle lane. Researchers also found that the highest differences between the two facilities corresponded with higher traffic volumes, supporting the conclusion that the distance created by a physical barrier between a bicycle facility and moving traffic affects air quality and exposure to ultrafine pollutant particles for people on bicycles.[34]



In a survey of people who travel on a major commercial street, streets with barrier-separation between moving non-motorized and motorized traffic were unanimously found to be the most comfortable for both bicyclists and drivers alike. The survey also indicates that the risk of being hit by a car door is a consistent worry for weekly and daily bicyclists, many of whom have been hit or almost hit in this situation. As parking-related crashes are a substantial portion of crashes in Cambridge (see Chapter 3), this is a significant issue here as well.[35]

SAFE ROUTES TO SCHOOL

In 2005, Congress created the Safe Routes to School (SRTS) program to improve safety and increase the number of children walking and biking to and from school through educational efforts, encouragement programs, and road improvements at or near schools. Research studies indicate that SRTS has increased rates of walking and biking and improved safety. Studies also show the program is an economically sound investment that can decrease health costs and school transport costs.[36]

Average Rates of Walking and Bicycling to School by Length of Participation in Safe Routes to School Program

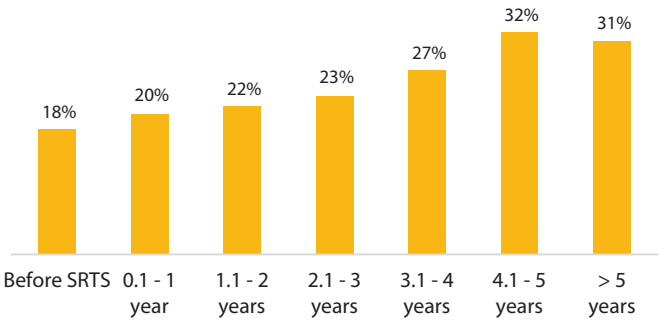


Figure 2.8: Safe Routes to School Programs have been shown to increase walking and biking to school by up to 78% after five years.[37]

In 2015, a research review was done based on the published evidence on four aspects of the SRTS program: impact of SRTS on children's health, impact on walking and biking rates, improved safety following implementation, and the economics of implementing SRTS programs. Key findings are:

- **Actively commuting to and from school could improve mental and physical health**
- **SRTS has increased the number of students who walk or bike to and from school**
- **Unsafe routes make it harder for students to walk or bike to and from school. SRTS has made it safer for students to walk or bike to or from school**
- **SRTS can lower health care and transportation costs for school districts and families[38]**

In 2015, Cambridge launched a Safe Routes to School initiative in to support and encourage children's use of active transportation. Details on this program are provided in Chapter 6.

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CHAPTER 3

BICYCLE DATA

CAMBRIDGE COMMUNITY SURVEY

As part of creating the Cambridge Bicycle Network Plan, an online survey was conducted during June 2014. The survey was open to anyone; although outreach about the survey was sent broadly throughout the community, most of the survey participants were people who ride bicycles regularly. Therefore, responses were not necessarily representative of the population of Cambridge or greater Boston. 733 valid responses were received.

The survey was designed to determine what kind of bicycle facilities are most comfortable for users and what will enable parents and guardians to feel that their kids can bike safely in the city. Survey questions focused on:

- **Bicycling habits**
- **Comfort with bicycling on different streets and various bicycle facility types**
- **Children's bicycling habits and parents'/ guardians' comfort allowing children to ride on different streets/facility types**

While a variety of important information can be taken from the results, the biggest takeaway is that people who bicycle in Cambridge would like to see more separated bicycle facilities and bicycle-friendly street designs. This applies whether the respondent rides frequently or rarely.

BICYCLIST COMFORT LEVELS

People were asked about their comfort levels riding a bicycle on a variety of different facility types -- on busy commercial streets and on non-commercial streets -- and sample photographs were shown for each condition. People were also asked a separate series of questions about bicycling with children, including similar questions about comfort levels on various road types and bicycle accommodations.

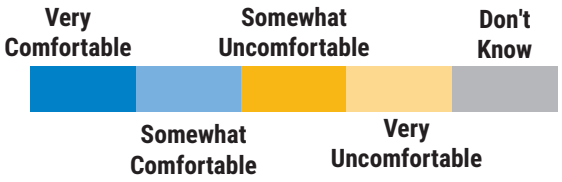
This section describes the highlights of the survey results. The full results of the survey can be found in Appendix B.

HOW DO PEOPLE FEEL BICYCLING ON COMMERCIAL STREETS?

Respondents were asked to rank how comfortable they would feel riding a bicycle on a busy commercial street based on facility type, including no accommodations at all, shared lane markings, a standard bike lane, a buffered bike lane, a separated bike lane, or raised cycle track. Protected bike lanes and raised cycle tracks both fall under the separated bike lane category, but were presented as separate facility types in the survey. Concerned bicyclists are defined as survey respondents who reported that they bike only some places or are not comfortable biking in the city.

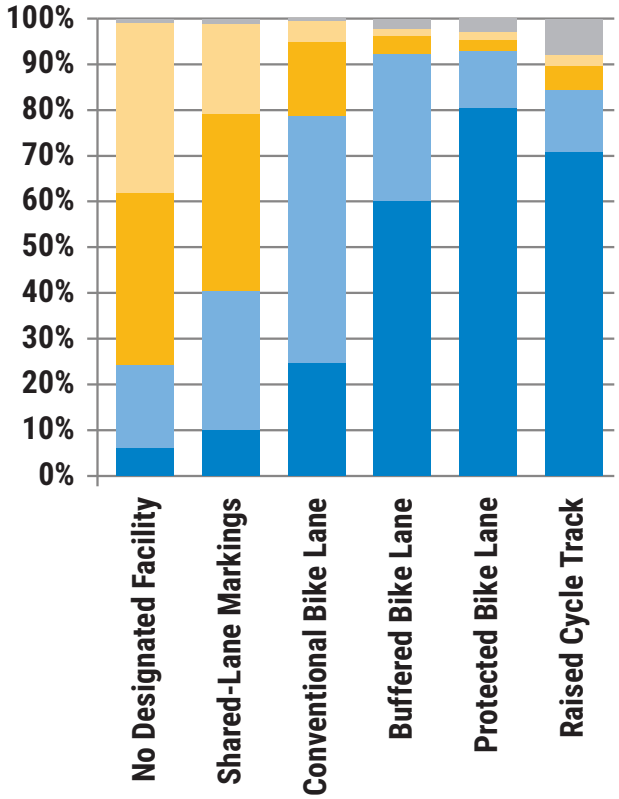
81% of all bicyclists and 68% of concerned bicyclists feel "very comfortable" on separated bicycle facilities.

Only 25% of all bicyclists and 4% of "concerned" bicyclists in the Cambridge feel "very comfortable" using conventional bicycle lanes.



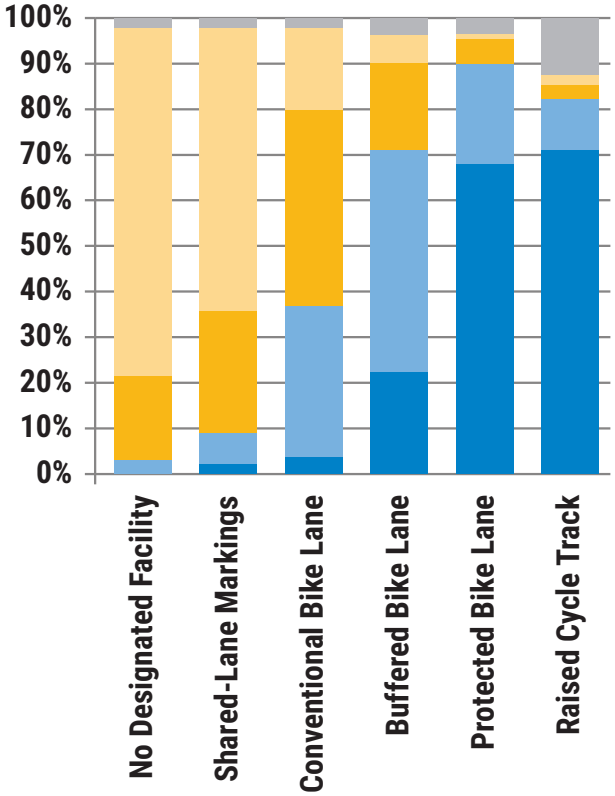
ALL RESPONDENTS

How comfortable do you feel with these bicycle facilities on busy, commercial streets?



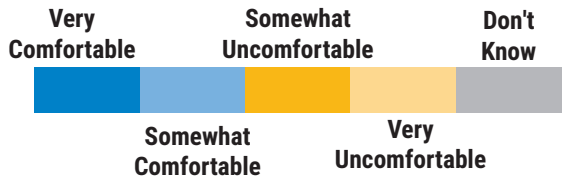
CONCERNED BICYCLISTS

How comfortable do you feel with these bicycle facilities on busy, commercial streets?

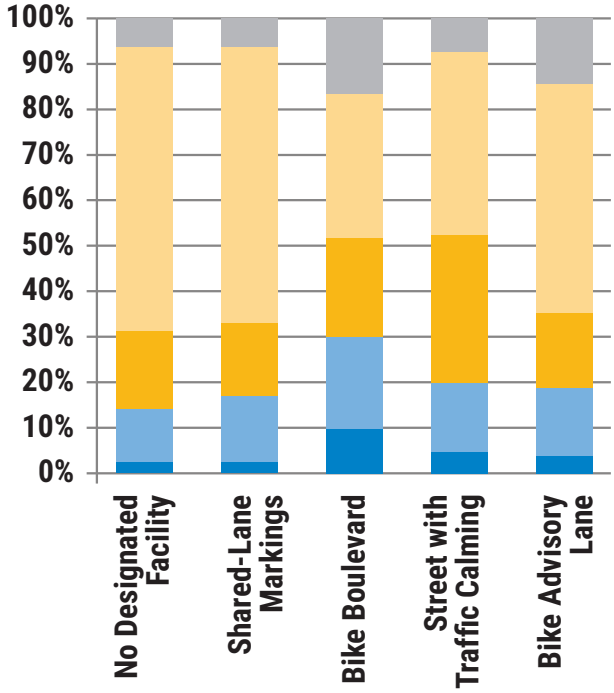


HOW DO PEOPLE FEEL BICYCLING WITH CHILDREN?

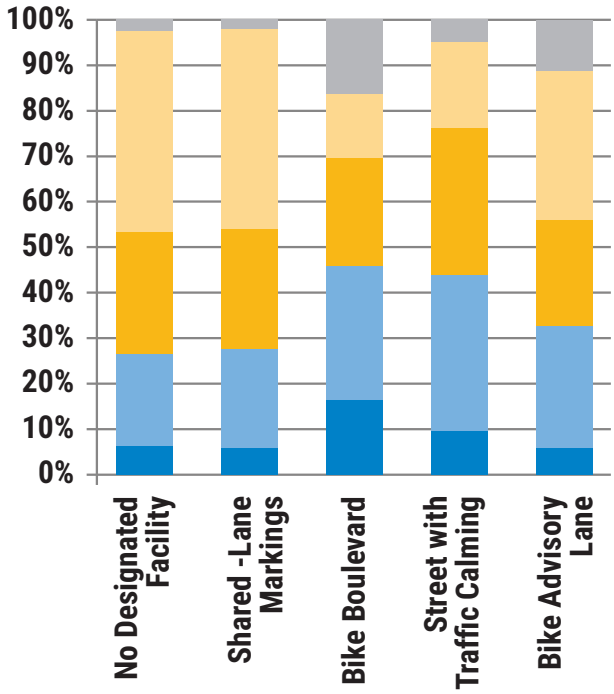
Respondents were asked about their comfort levels for children traveling on streets, either with an adult, or on their own. There is further detail in the survey that considers ages; the charts here are an overall summary.



How comfortable do you feel about your children on these bicyle facilities on non-commercial streets, WITHOUT an adult?



How comfortable do you feel about your children on these bicyle facilities on non-commercial streets, along WITH an adult?



HOW DO PEOPLE FEEL BICYCLING ON NON-COMMERCIAL STREETS?

Respondents were also asked about other street design treatments that would be relevant for noncommercial streets, such as traffic calming, bicycle priority lanes and bicycle boulevards. There was somewhat more uncertainty about some of these, primarily because of the lack of familiarity; while traffic calming is extensive in Cambridge, there are not yet bicycle boulevards or bicycle priority lanes in the city.

BICYCLE FACILITIES ON NON-COMMERCIAL STREETS

Street with shared lane markings

Street with shared lane markings

Bicycle boulevard

Bicycle boulevard

Street with traffic calming

Street with traffic calming

Figure 3.1: Examples of bicycle facilities on non-commercial streets shown to survey respondents. See Chapter 4 for details on various facility types.

Traffic calming can improve the bicycling experience by slowing vehicular speeds and making sharing the road more comfortable.

WHAT TYPES OF BIKE FACILITIES DO PEOPLE PREFER?

Survey respondents were asked to rate the importance of various bicycle facility options that they would like to see implemented in Cambridge.

Protected bicycle lanes received the highest rating, with 92% of respondents saying that implementing them in Cambridge is important, and two-thirds saying it was "very important.

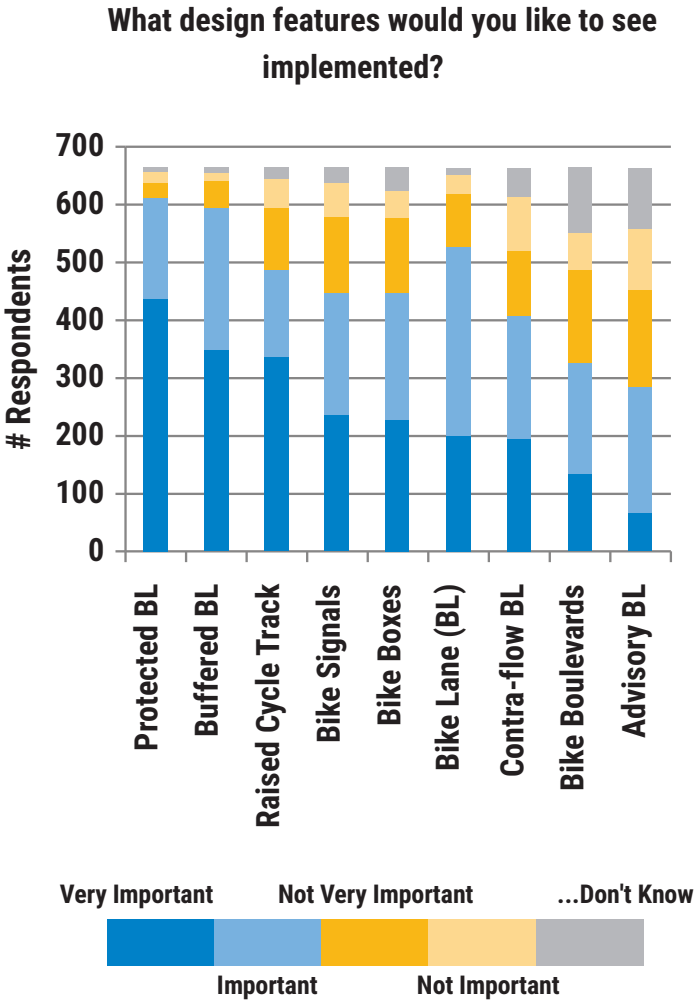


Figure 3.2: Concord Ave. separated bike lane (top)
Figure 3.3: Vassar St. separated bike lane (middle)
Figure 3.4: Norfolk St. contra-flow bike lane (bottom)

BICYCLE COUNTS

HOW MANY PEOPLE ARE CHOOSING TO TAKE TRIPS BY BIKE?

Cambridge has among the highest rates of walking and bicycling in the United States; almost a third of Cambridge residents walk or bicycle to work. Commute trips tend to be the focus of transportation analysis and surveys, yet they represent less than 20% of all trips taken. Other trip purposes – shopping, leisure, personal business, recreation – constitute approximately 80% of trips.

Between 2009 and 2011, Cambridge undertook a series of in-depth surveys to learn more about residents' travel patterns. Respondents used a bicycle for a trip approximately 6-9% of the time, depending upon the neighborhood and type of trip.[1] The 2011 CitySmart survey showed an average of 65% of bicycle users took a shopping trip on the survey day. The survey also found that people who use bicycles for transportation take more trips per day than users of any other mode – about 5 trips per day on average.

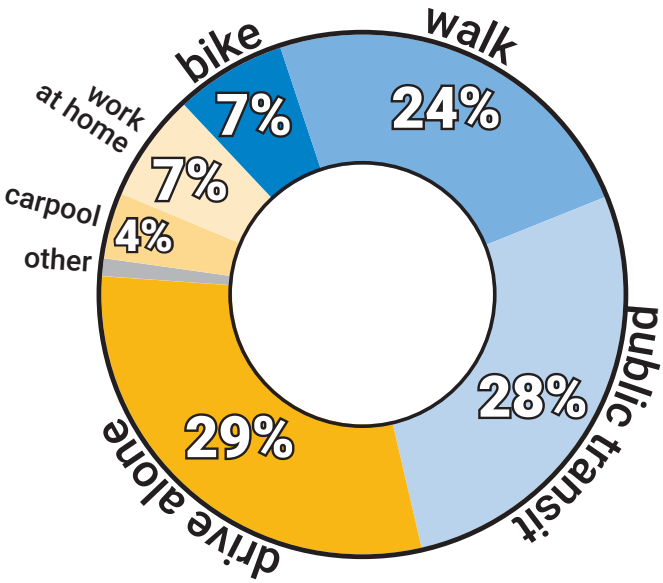


Figure 3.5:
Mode Split for Cambridge Residents Commuting to Work

2011-2013 American Community Survey

Similarly, surveys of visitors to three of Cambridge's commercial districts (Porter Square, Central Square, and Kendall Square) show that a significant portion of visitors travel by bicycle. In recent surveys, 6% of visitors to Kendall Square traveled by bike, while 7% of Central Square visitors reported doing so. In Porter Square, a full 10% of respondents traveled by bicycle.

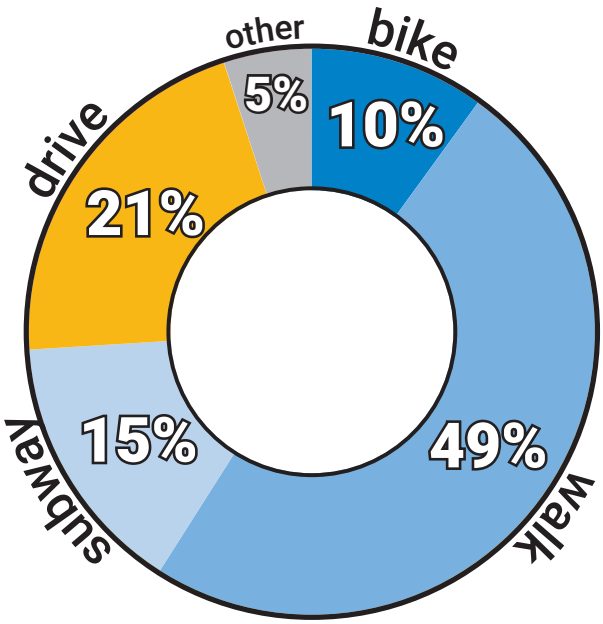


Figure 3.6:
Porter Square Mode of Transit Survey

CitySmart 2011

HOW MANY BIKES DO WE OWN?

The 2009 CitySmart survey showed that 65% of households owned at least one bicycle and, on average, owned 2.6 bicycles. This means that for every 100 households, there were 169 bicycles.

Other studies in the U.S. also show substantial bicycle ownership rates: Florida Metro Area Study (2003): 1.4 bikes/household; Winston-Salem, NC (2005): 78% of households had at least one bike; National Household Travel Survey (2001): 1 working adult bike/household.

TRENDS IN NUMBERS

Cambridge conducts biennial counts of bicycle traffic at various intersections throughout the city. These help to illustrate trends throughout the city and how different projects have affected riders. While there has been a steady upward trend in bicycling, there was a slight decline in 2014 when compared with 2012. A closer look suggests that the extensive roadway construction on several major corridors in the city appears to be correlated with a decline in riders at affected intersections, while other intersections have seen dramatic increases in the number of riders. The charts here demonstrate some of the trends.

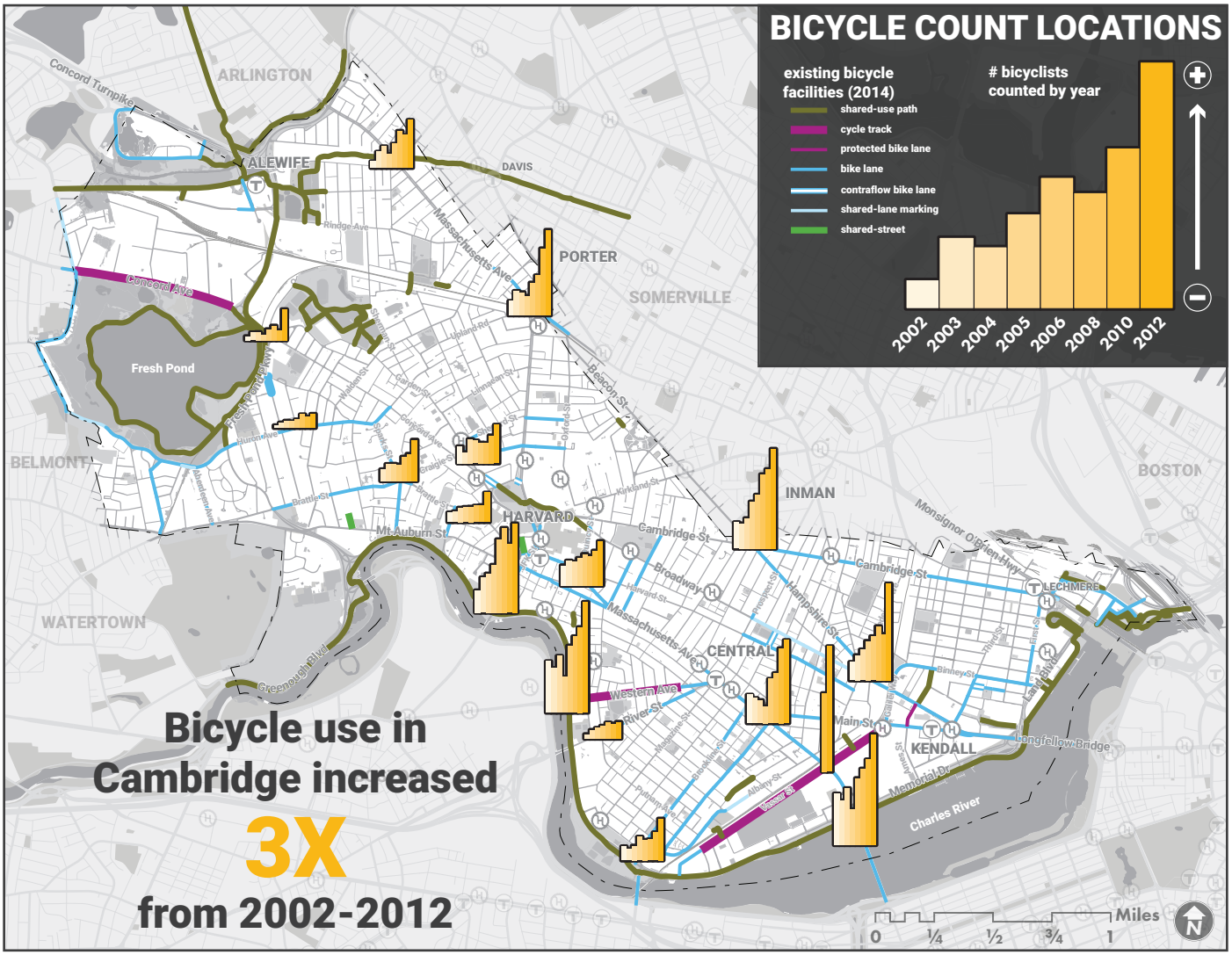


Figure 3.7: Cambridge Bicycle Count Map, 2002-2012, Combined AM and PM Peak Counts

Figure 3.8 shows the results of all of the counts the city has done since 2002. There was a drop in counts between 2012 and 2014, which was the first drop since counts began. The following section provides further analysis of the 2014 counts.

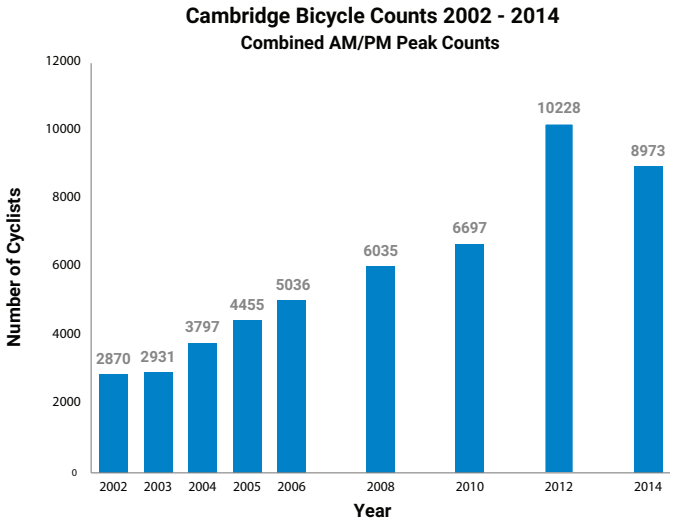


Figure 3.8: Cambridge Bicycle Count Chart, 2002-2014, Combined AM and PM Peak Counts

BIKE TRAFFIC AND CONSTRUCTION

When counts were conducted in 2014, extensive construction projects were underway throughout the city. Even if the end result of construction projects is better infrastructure and safer streets, the process of getting there can be months or even years of disruption and stressful travel.

By separating the data from the 2014 counts by streets with and without construction, we can see the impact construction has on ridership at an intersection (see Figure 3.9). Intersections with construction showed the expected drop in ridership between 2012 and 2014, while those with construction showed a continued upward trend in ridership. This analysis suggests that construction could be a factor in the overall drop in ridership noted between 2012 and 2014 (see Figure 3.8). Pavement quality, noise, and exposure to construction are all factors bicyclists consider when choosing routes. During construction periods, some people may alter their route significantly, or they may choose another mode of transportation. When construction activities conclude, ridership numbers can be expected to rebound.

It is also important to note that a majority of intersections where counting occurred saw a net increase in bicycle traffic between 2012 and 2014. Out of seventeen counting locations, nine saw a net increase. In particular, four out of five locations along Massachusetts Ave where counts took place saw a net increase in bicycle traffic.

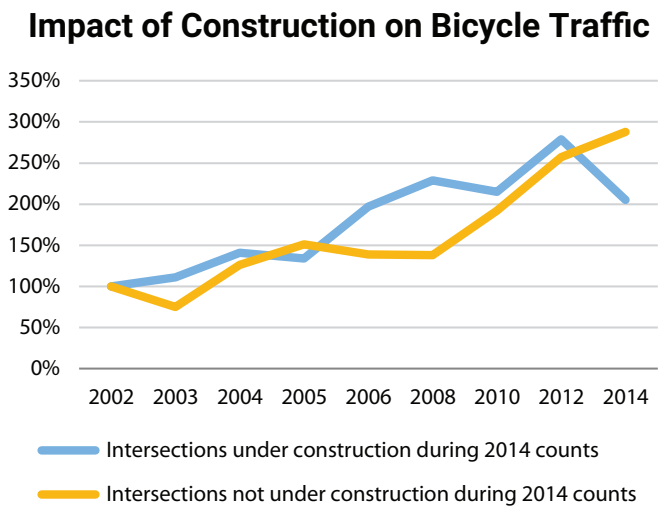


Figure 3.9: Net change in volumes at intersections with and without construction during 2014 counts.

Intersection	Net Change in Volume
Brattle St/Mason St	⌄⌄
Brattle St/Sparks St/Craigie St	⌄⌄
Broadway/Hampshire St	⌄⌄
Brookline St/Granite St	⌃⌃
Fresh Pond Pkwy/Concord Ave	⌄⌄
Huron Ave/Fayerweather St	⌄⌄
Garden St/Concord Ave	⌃⌃
Inman Square	⌃⌃
JFK St/Memorial Dr	⌄⌄
Lafayette Square	⌃⌃
Massachusetts Ave/Cedar St	⌃⌃
Massachusetts Ave/Vassar St	⌃⌃
Massachusetts Ave/Memorial Dr	⌃⌃
Porter Square	⌄⌄
Quincy Square	⌃⌃
River St/Putnam Ave	⌃⌃
Western Ave/Memorial Dr	⌄⌄

Figure 3.10: Cambridge Bicycle Counts, 2002-2014: Net Change by Count Location

MASSACHUSETTS AVE AND VASSAR STREET

Because bicycle count data only exists for the intersection of Massachusetts Ave and Vassar Street since 2010, this intersection is not included in the total counts when comparing data from before 2010. However, the number of bicyclists at this intersection has exploded, more than doubling between 2010 and 2014. One explanation for this rise is the separated bike lane on Vassar Street, which provides riders a sense of security that they do not have on other streets. Additionally, Vassar Street passes through MIT's campus to Kendall Square, both popular destinations with increasing amounts of development and concomitant jobs.

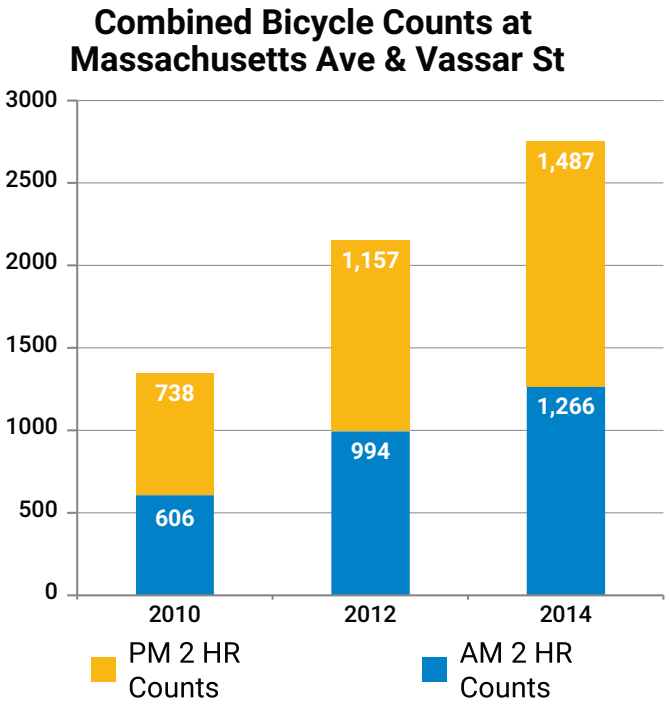


Figure 3.11: Cambridge Bicycle Counts, Massachusetts Ave and Vassar St, 2010-2014

Figure 3.12: The intersection of Vassar St and Massachusetts Ave.

COUNTING INTO THE FUTURE

In 2015, Cambridge installed a permanent bicycle counter in Kendall Square. Funded by a grant from the Helen & William Mazer Foundation, the "Eco-TOTEM"[2] counts bicyclists via in-ground loop detectors, and displays on the monitor how many people ride by. The counter displays daily and cumulative totals and also captures weather data to use for analytical purposes. The data can be used in many ways:

- **To publicly show how many people are bicycling and make a statement that "people who ride bikes count"**
- **The 24/7 data can be used to analyze daily, weekly, monthly and seasonal patterns. This can be used to help extrapolate data from other counts**
- **The data assist with determining crash rate analyses**
- **Data can be viewed at: http://eco-public.com/public2/?id=100023038**

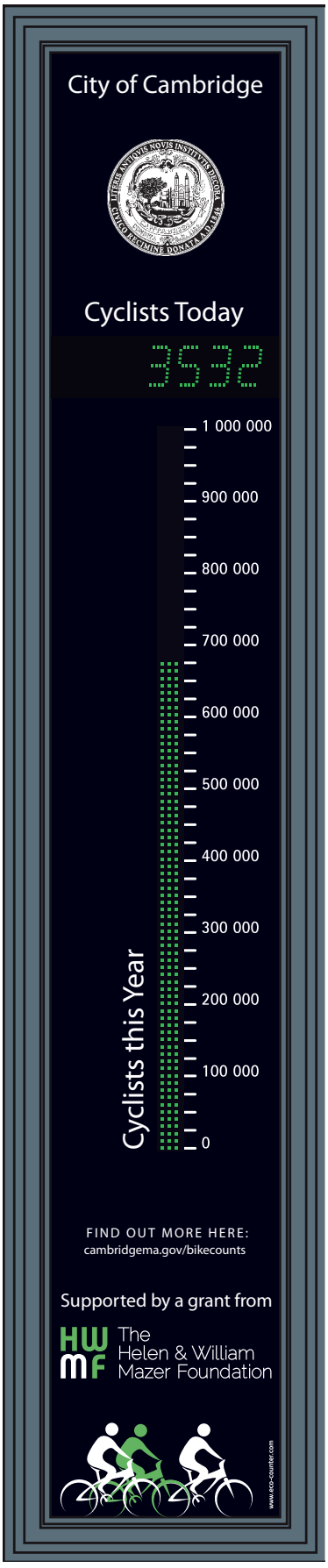


Figure 3.14: Cambridge "Eco-TOTEM" Design

BICYCLE CRASH DATA AND ANALYSIS

In the United States, bicycle crashes are generally considered to be under-reported, and few crashes that don't involve a motor vehicle are reported. There is also no reliable source of exposure data in the U.S. to really ascertain crash risk: there are no reliable statistics on how many miles people travel on bicycles each year, or how long it takes them to cover these miles, and thus how long they are exposed to motor vehicle traffic. Therefore, it is difficult to gain a comprehensive picture of bicyle crash statistics.

Since 2004 Cambridge has made a significant effort to gain a clearer picture of local crash risks for people who ride bicycles and to use that data to reduce the frequency and severity of crashes. The City's findings are included in the sections below.

DATA COLLECTION

Beginning in 2004, Cambridge has collected robust data for all reported bicycle crashes. It is recognized that this is a limited reflection of all crashes that occur. The reported crashes tend to be ones that are more severe, and those that involve a motor vehicle. In addition, these are only crashes on Cambridge streets and do not include the streets within the city under state jurisdiction, such as parkways and highways.

Nonetheless, the crash data collected in Cambridge is much more comprehensive than the data collected in many other municipalities. It includes any time any kind of incident whatsoever is reported to the police. Unfortunately, most places do not collect good bicycle crash data, and do not collect records where no injury occurred. This makes any comparisons between communities difficult.

BICYCLE COUNT AND CRASH TRENDS

In order to match annual crash numbers with annual count numbers, the biennial count data were extrapolated to annual counts using a permanent bike count station as a reference, and national analysis standards. The Federal Highway Administration Vehicle Miles Travelled formula was applied to the annual counts to attain citywide Bicycle Miles Travelled (BMT).

As shown in Figure 1, BMT has grown from 4.6 million in 2004 to 15.5 million, an increase of 235% over nine years. Bicycle use has more than tripled in Cambridge in less than a decade.

Over the same period, reported crashes involving a bicycle have increased as well. 91 crashes were reported to Cambridge Police Department in 2004 and 215 in 2012. This represents an increase of 136%. Both bicycle and count trends are shown in Figure 1. While both are trending up, bicycle use is rising much faster than reported crashes.

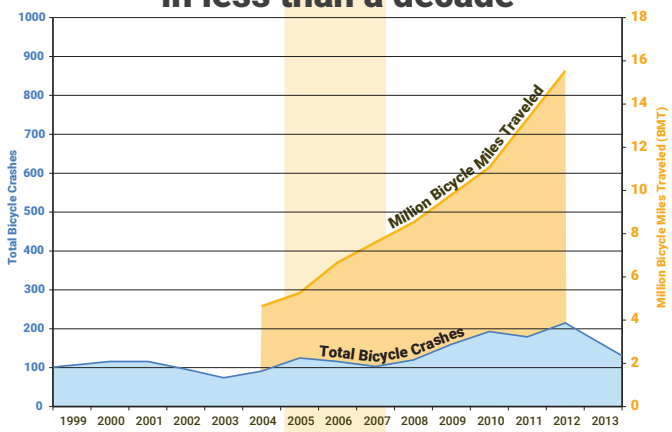
CRASH RATES

The best way to describe the relative change in the level of safety of travelling by bicycle is with a crash rate. A rate accounts for changes in volume of use. With this data, a rate can be shown, i.e., the number of crashes per bicycle mile traveled each year. As shown in Figure 2, the crash rate has declined from 19.6 crashes per million BMT in 2004 to 13.8 in 2012, a drop of 29%.

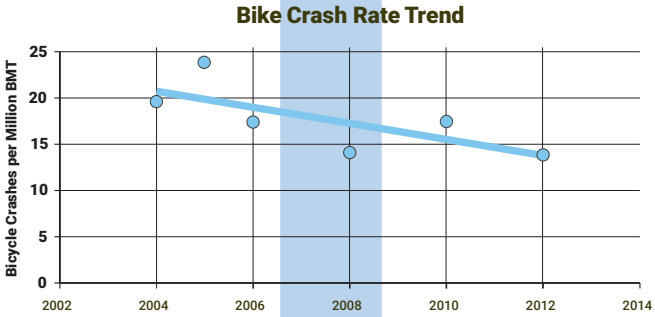
Bicycle miles traveled in Cambridge increased by

235%

in less than a decade



Bicycle Miles Traveled (BMT) is an adaptation of the traditional traffic planning tool Vehicle Miles Traveled (VMT). It is an estimate of overall usage during a specific timeframe and is useful for calculating exposure to crashes. The BMT along these corridors is derived by applying national standards for estimating usage to the bicycle counts recorded throughout the city.



Bicycle crash rates have decreased in Cambridge by

29%

in the same time period

The good news: The bicycle crash rate has been decreasing in Cambridge over the period of time that we have been tracking data to enable us to determine a crash rate.

Figure 3.15: CambridgeBicycleCounts vs. Crash Rate

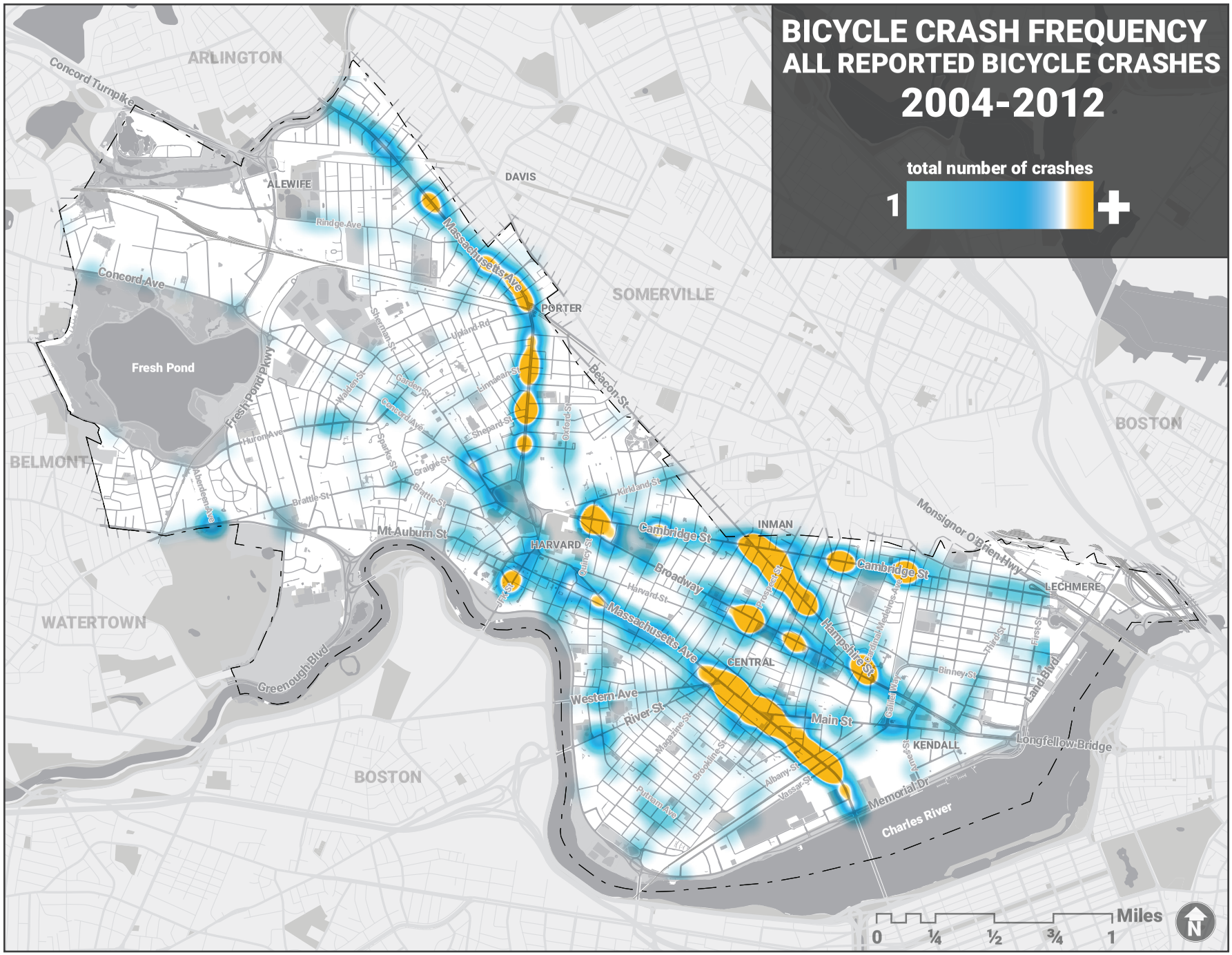


Figure 3.16: Bicycle Crash Frequency, 2004-2012

SAFETY IN NUMBERS

The Cambridge bicycle trends correspond with international research demonstrating that as more people start riding bicycles, a person riding a bicycle is far less likely to collide with a motor vehicle or suffer injury and death. This holds for pedestrians as well. It's not necessarily because there are fewer cars on the roads, but because motorists seem to change their behavior and drive more safely when they see more bicyclists and pedestrians around. There is safety in numbers.

Studies have shown consistently that the number of motorists colliding with pedestrians or bicyclists doesn't increase equally with the number of people walking or bicycling.[2] For example, a community that doubles its bicycling numbers can expect a one-third drop in the per-bicyclist frequency of a crash with a motor vehicle.

One of the most rigorous and frequently cited studies on this topic concludes unequivocally that in locations where more people walk or ride bicycles, the overall injury rate due to motor vehicle collisions decreases.[4]

CRASH TYPES

Each bicycle crash is categorized by type, which helps us understand why crashes occur and how we may prevent future crashes. These types are illustrated in Figure 3.17.

Angle crashes are the leading type of bike crash, with the dooring and left hook types prevalent as well, as shown in Figure 3.18.

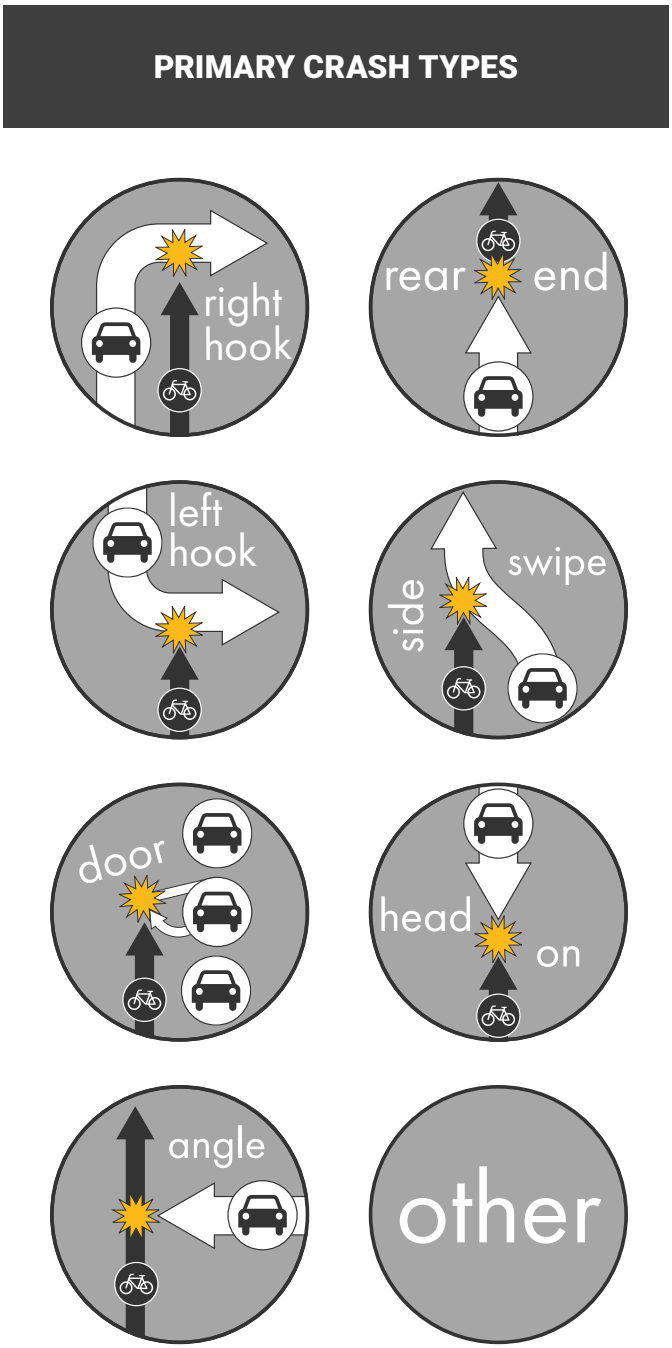


Figure 3.17: Primary Bicycle Crash Types

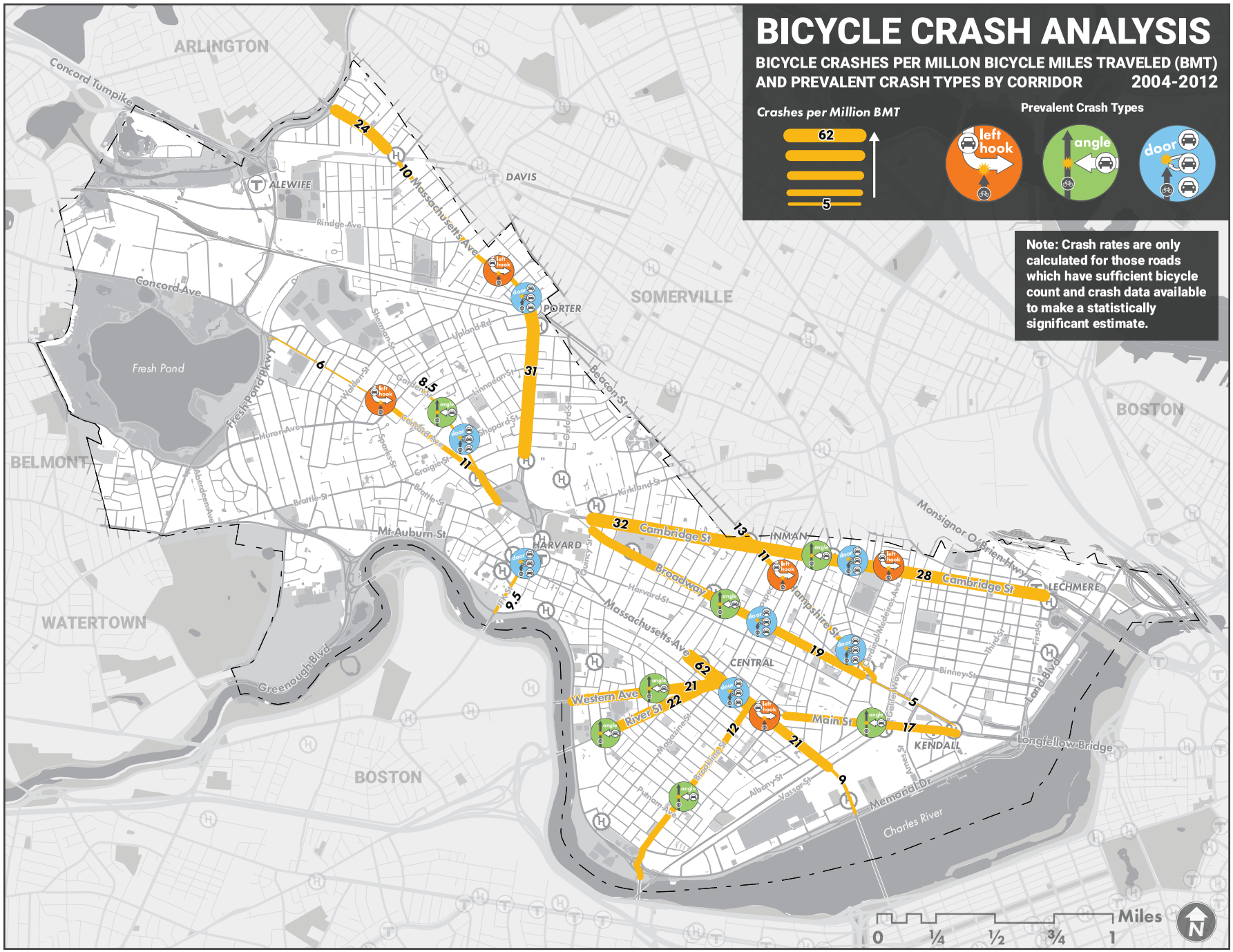


Figure 3.18: Bicycle Miles Traveled & Prevalent Bicycle Crash Types by Corridor

INJURY SEVERITY

The severity of the bicyclist's injury in each crash is recorded. Most reported injuries were minor. Just 5% of reported injuries were labeled "incapacitating;" this means that the injury was such that the person was not mobile (e.g., having a broken leg or head trauma), while in 18% of crashes the bicyclist reported no injury at all. About a third of the incident reports did not indicate whether there was an injury or not; while we cannot be certain that there was no injury, those are most likely to be without injury, and unlikely to be anything in the most serious category.

Figure 3.16 shows the frequency of reported crashes according to location; this is a sum total of all crashes over the nine year period from 2004-2012, inclusive. Any one crash will show up in a light color, with darker colors representing more crashes and orange showing the most.

However, as discussed above, in order to assess risk and safety, we need to look at crash numbers together with the number of people bicycling, translated to number of miles traveled. Figure 3.18 shows the crashes per million bicycle miles traveled, together with the frequent crash types on those corridors. This helps to focus on those areas that are most in need of attention to address bicyclist safety.

The crash data provide Cambridge with information to help address the most common types of crashes occurring. As the City continues to collect and analyze data related to bicycle crashes, we can input the analysis into design and policy solutions to improve bicycle safety. The strategies will include infrastructure improvements as well as education and enforcement for all road users. These various tools are discussed in detail throughout this plan.

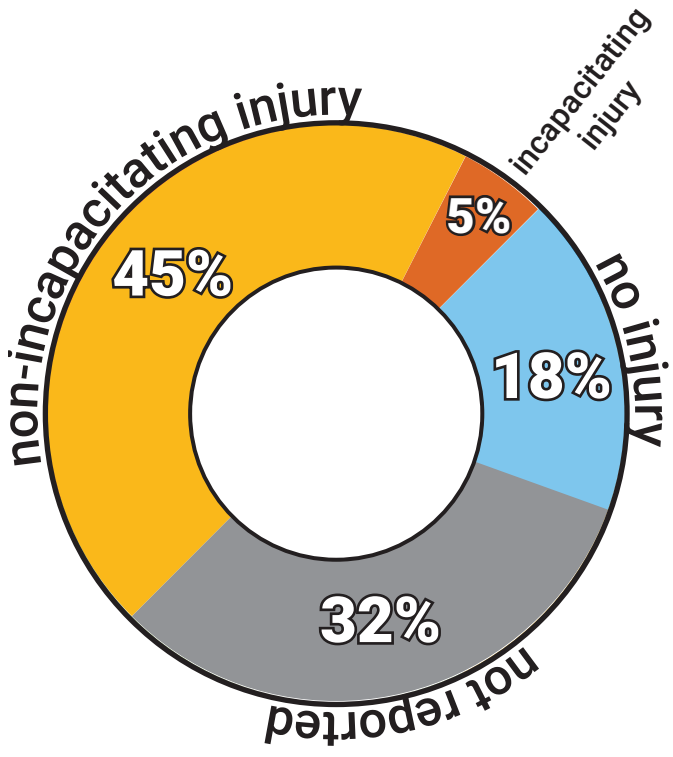
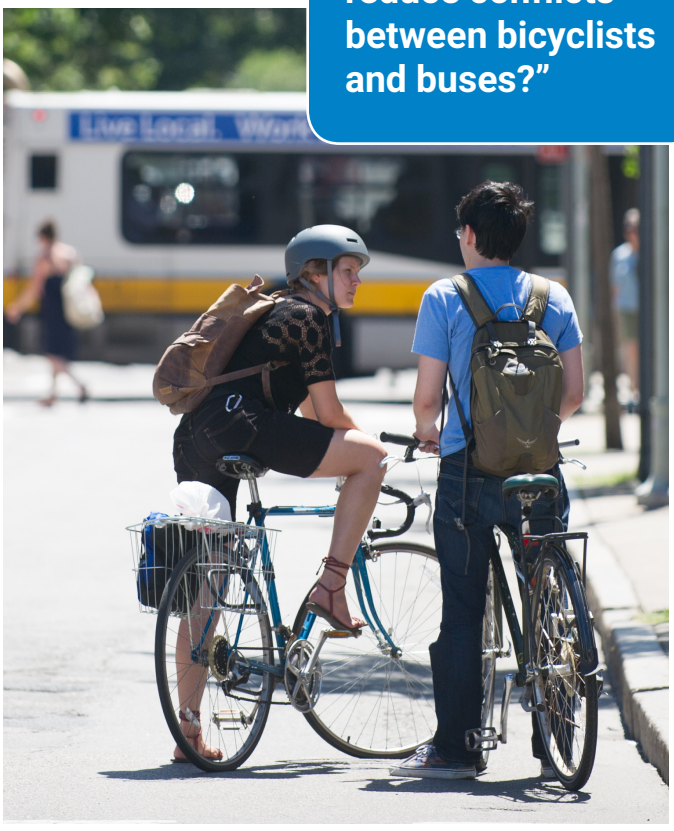


Figure 3.19: Injury severity for bicyclists involved in crashes, 2004-2012

"How do we reduce conflicts between bicyclists and buses?"



BICYCLIST SAFETY AROUND TRUCKS

Crashes involving large trucks are more likely to result in a pedestrian or bicyclist fatality than crashes involving passenger vehicles (the two fatalities of people on bicycle in Cambridge that have occurred in the past 13 years have both involved trucks). Truck crashes are also more likely to be side-impact crashes.

In order to address safety issues related to large trucks, the City is partnering with the Volpe National Transportation Systems Center on a vehicle redesign strategy that will establish recommendations for implementing truck side guards, blind spot mirrors, and other vehicle-based technologies on the City-owned truck fleet.[5]

Side guards on large trucks protect bicyclists and pedestrians from being swept underneath the vehicle in a side-impact crash. Since being required in the UK, they have helped reduce bicyclist fatalities in side-impact crashes with trucks by 61 percent and pedestrian fatalities by 20 percent. Enhanced mirrors substantially improve sight lines for drivers, particularly for cyclists riding on the right hand side of the vehicle.

Figure 3.20: Cambridge Department of Public Works employees demonstrating truck side guards on City trucks.

ENDNOTES

1 CitySmart Survey: www.cambridgema.gov/citysmart.

2 More information about the Eco Counter is available at http://www.eco-compteur.com/en/

3 University of New South Wales (2008, September 7). A Virtuous Cycle: Safety In Numbers For Bicycle Riders. ScienceDaily. Retrieved December 4, 2008, from http://www.sciencedaily.com/releases/2008/09/080903112034.htm

4 P L Jacobsen, "Safety in numbers: more walkers and bicyclists safer walking and bicycling," Inj. Prev. 2003; 9; 205-209

5 Volpe National Transportation Systems Center, "Truck Side Guards Resource Page," United States Department of Transportation, 2015, http://www.volpe.dot.gov/our-work/truck-side-guards-resource-page

CHAPTER 4

BICYCLE FACILITY TOOLBOX

GOALS AND PRINCIPLES

PLANNING PRINCIPLES FOR URBAN BICYCLING NETWORKS

This chapter provides of an overview of the variety of tools to consider when designing streets to be welcoming and comfortable for people of all ages and abilities to bicycle.

Planning and designing for bicyclists is similar to other transportation modes in which safety, travel demand, user delay, convenience, and economics are all taken into consideration. Although all roads - except for limited access highways - are bikeways, the type of facility will vary depending on the street type, usage, and conditions.

The City aims to create a low-stress bicycle network using techniques such as separating bicyclists from motor vehicle traffic and reducing speed and volume where appropriate to create a comfortable shared environment for all users.

KEY DESIGN PRINCIPLES

- **Bicycle travel on all streets should be direct, continuous, safe, and convenient.**
- **Facility improvements will aim to accommodate people of all ages and abilities.**
- **Bicycle facilities with a high level of comfort should be provided on major streets, using tools as described in this chapter such as separated bicycle facilities and buffered bike lanes.**
- **Off-road facilities will be expanded and connected to existing networks within the city and region. Off-road facilities are desirable on high-speed and high volume roadways, along rail corridors, and to provide access to parks and recreational areas.**
- **Local street improvements will be made on a case-by-case basis using a variety of treatments described in this chapter, such as bicycle lanes and traffic calming.**

BICYCLE FACILITY PLANNING AND TRACKING

Cambridge aims to improve its bicycle facilities each year through an ongoing planning and design process. Existing and planned facilities, as of August 2015, include:

Bicycle Facility Type	Existing (Miles)	Planned (Miles)
Conventional Bicycle Lanes	19	2.5
Off-Road Paths	16	4
Shared Lane Markings	1	2.3
Contra-flow Bicycle Lanes	0.25	n/a
Shared Street	0.25	n/a
Separated Bicycle Lanes	2	1.7

A map of existing and planned bicycle facilities is included in the Appendix C.

IMPROVEMENT POLICIES

Bicycle facilities are considered at the inception of all Cambridge transportation projects and become incorporated into the design of each project. City departments coordinate their work to ensure that all construction is reviewed in the design phase of every project to address the needs of bicycle transportation. Often these improvements can be made at a low cost, benefitting people who walk, bike and drive alike.

TECHNICAL REFERENCES FOR FACILITY DESIGN

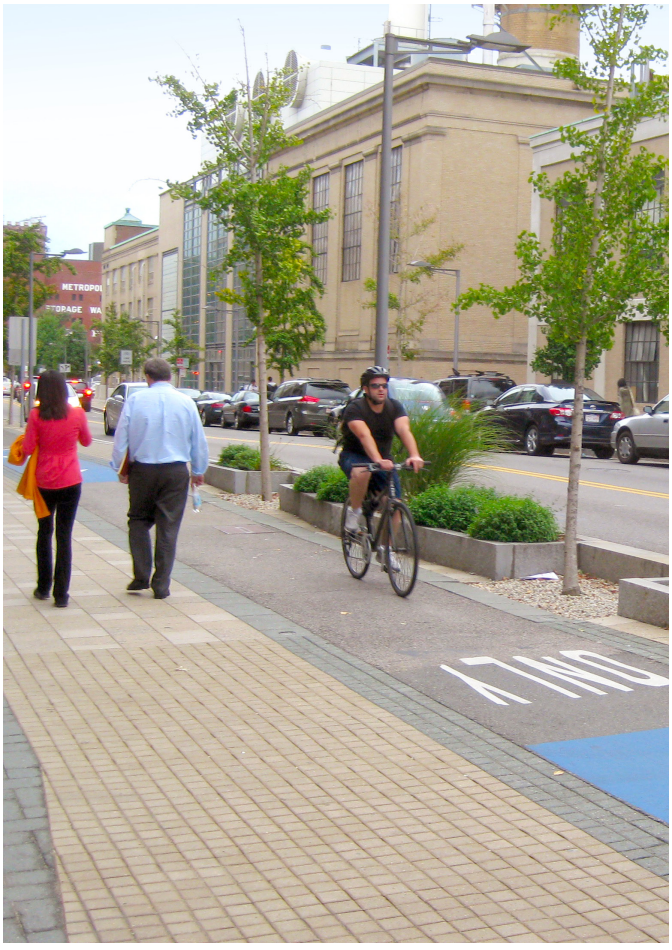
Bicycle facility designs are developed using engineering judgment with reference to state of the art technical guidance, current research, best practices, and professional experience. National and international guides used include but are not limited to the **NACTO Urban Bikeway Design Guide, CROW Design Manual for Bicycle Traffic, AASHTO Guide for the Development of Bicycle Facilities, Manual on Uniform Traffic Control Devices, FHWA Shared Use Path Guidance, and FHWA Separated Bike Lane Planning and Design Guide**.

Cambridge has also developed reference materials for guidance, such as the Cycle Tracks: A Technical Review of Safety, Design, and Research (June 2014).

SEPARATED BICYCLE FACILITIES

Separated bicycle facilities are vertically separated bicycle lanes that may be at sidewalk level or roadway level. For sidewalk level facilities, the furnishing zone may be between the separated bicycle lane and the motor vehicle travel lane, and/or pedestrian area to increase separation and comfort. Benefits include clear separation between bicycle, pedestrian and motor vehicle operating space. This facility type is also known as cycle tracks or protected bicycle lanes.

Separated bike lanes have been shown to increase ridership on corridors where they are implemented, and to make bicycling more appealing to a wider range of bicyclists, especially those identified as "interested but concerned." See Chapter 2 for details.



Design considerations:

+ Preferred facility for roadways with high vehicular volumes, speeds, and/or complex traffic patterns.
+ Bicycle lane may be elevated to sidewalk level or at roadway level.
+ Typically **5-7 feet wide** plus **1-3 foot wide roadway buffer**.
+ May require specialized intersection treatments.
+ Potential parking impacts to maintain sight lines.
+ Operational requirements for street sweeping and snow plowing.
+ Bus stop operations, where applicable.
+ For additional design guidance, refer to **Cambridge's Cycle Tracks: A Technical Review of Safety, Design, and Research**, **NACTO Urban Bikeway Design Guide** and **FHWA Separated Bike Lane Planning and Design Guide**.

TWO-WAY SEPARATED BICYCLE FACILITIES

Two-way separated bicycle facilities are physically separated bicycle lanes that allow bicycle movement in both directions on one side of the road. This facility dedicates and protects space for bicyclists and improves perceived comfort and safety. A two-way facility usually requires less space than two one-way facilities, and can make maintenance easier.

Design considerations:

+ Preferred along roadways with high vehicular volumes, speeds, and/or complex traffic patterns.
+ May improve connectivity for bicyclists when used on one-way streets.
+ Typically **8-14 feet wide** plus a **1-3 foot wide roadway buffer**.
+ May require specialized intersection treatments.
+ Potential parking impacts to maintain sight lines.
+ Operational requirements for street sweeping and snow plowing.
+ Bus stop operations, where applicable.
+ For additional design guidance, refer to **Cambridge's Cycle Tracks: A Technical Review of Safety, Design, and Research**, **NACTO Urban Bikeway Design Guide** and **FHWA Separated Bike Lane Planning and Design Guide**.

SHARED USE PATHS

A shared use path is defined as a trail permitting more than one type of user. Paths serve as part of the transportation circulation system and support multiple recreation opportunities, including walking, bicycling, and in-line skating. A shared use path is physically separated from motor vehicular traffic with an open space or barrier.

Design considerations:

+ Often located along active or abandoned rail corridors, utility easements, or along streams, rivers, or other linear features.
+ Typically **10-14 feet wide**.
+ May require specialized intersection treatments.
+ Must be ADA-compliant.
+ Provides low-stress, higher comfort bicycle and pedestrian connections.
+ For additional design guidance, refer to **AASHTO Guide for the Development of Bicycle Facilities**.

BICYCLE LANES

Bicycle lanes designate an exclusive lane for bicyclists through the use of pavement markings and signage. The bicycle lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bicycle lanes are typically on the right side of the street. Benefits include providing clearly delineated space on the road for bicyclists and sending a message to other road users to expect bicyclists.

Design considerations:

+ Most appropriate for medium to low volume streets with **vehicular speeds of 30 mph or less**.
+ Typically **5-6 feet wide**.
+ May require delineation at complex intersection or treatments to facilitate left turns.
+ Parking lanes should be marked to ensure vehicles park as close to the curb as possible.
+ Enforcement may be required to keep motorists from parking or stopping in the bicycle lane.
+ For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

BUFFERED BICYCLE LANES

Buffered bicycle lanes are conventional bicycle lanes with a designated buffer space separating the bicycle lane from the parking lane. Benefits include reduced risk of "dooring" and greater space for bicyclists to maneuver.

For streets with no on-street parking, the buffer can be placed between the bike lane and the adjacent travel lane to provide additional separation from motorized traffic. A potential disadvantage of buffered bike lanes is that they are more liable to encroachment from double-parked motor vehicles or delivery vehicles.

Design considerations:

+ Preferred treatment where separated bike lanes are not feasible.
+ Provides further separation from parked vehicles and opening car doors, especially in areas with high parking turnover.
+ Typically **5 feet wide bicycle lane** and a minimum of **2 feet wide buffer zone**.
+ For additional design guidance, refer to **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities.**

LEFT-SIDE BICYCLE LANES

Left-side bicycle lanes are conventional bicycle lanes placed on the left side of one-way streets or two-way median divided streets. They are usually implemented where the majority of bicycle traffic is going straight or accessing streets or other connections on the left side. Benefits include avoidance of potential conflicts on the right side of the street, such as buses, opening car doors, and people accessing parked vehicles.

Design considerations:

+ Most appropriate for medium to low volume streets **with vehicular speeds of less than 30 mph**.
+ Typically **5-6 feet wide**.
+ Avoids conflicts with parked vehicles and bus stops.
+ May require delineation at complex intersection or treatments to facilitate right turns.
+ For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

ADVISORY BICYCLE LANES

An advisory bicycle lane is used on low-volume two-way streets that are too narrow to fit bicycle lanes and car travel lanes separately. An advisory bicycle lane is marked with a dotted line to the left, directing cars to travel outside the lane if possible. These markings give bicyclists a space to ride, but are also available to motorists if space is needed to pass oncoming traffic.

Design considerations:

+ **Most appropriate for low volume and speed roadways without centerlines.**
+ **Typically 5-7 feet wide and delineated with a white dotted lane line.**
+ **May require education to instruct bicyclists and motorists how to use correctly.**

CONTRA-FLOW BICYCLE LANES

Contra-flow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way street into a two-way street: one direction for motor vehicles and bicycles, and the other for bicycles only. Such facilities provide more direct connections for biyclists and allow them to avoid streets that are less conducive for bicycling.

Design considerations:

- Preferred on the standard side of the roadway for the direction of travel.
- Typically **5-6 feet wide**.
- May require additional pavement markings, signs, and traffic control devices at intersections.
- For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

SIGNED CONTRA-FLOW STREETS

A signed bicycle contra-flow is on a one-way residential street which is signed for two-way bicycle travel. Unstriped, signed bicycle contra-flow streets are roadways with low vehicular speeds and volumes that can assist bicyclists with making direct connections.

Design considerations:

+ Preferred on low volume and low speed roadways.
+ May require additional considerations at intersections, including signs and markings.
+ For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**.

BICYCLE PRIORITY STREETS

Bicycle priority streets are roadways with low motorized traffic volumes and speeds that are designated and designed to give bicycle travel priority. Bicycle priority streets use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles. Bicycle priority streets can also include safe, convenient bicycle crossings of busy arterial streets. This facility type is also known as a bicycle boulevard.

Design considerations:

- Preferred on low volume and speed roadways that discourage speeding and cut-through vehicular traffic.
- May require traffic calming devices such as speed tables, traffic circles, diverters, or chicanes.
- May require wayfinding signage to direct bicyclists.
- Opportunity for plantings, rain gardens, and green infrastructure.
- For additional design guidance, refer to **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

SHARED STREETS

A shared street is one in which there is no vertical curbed delineation dividing the roadway and sidewalk. The roadway and sidewalk surfaces are at the same level to create a continuous space. The space is shared between motorists, pedestrians, and bicyclists.

Design considerations:

- Most appropriate for low volume and low speed roadways.
- Ideally for roadways of **3,000 average daily traffic** or less and **speeds at or under 20 mph**.
- May require coordination of loading activities for adjacent buildings.
- For additional design guidance, refer to **NACTO Urban Street Design Guide**.

SHARED LANE MARKINGS

Shared lane markings (SLM) are road markings used to indicate a shared lane environment for bicyclists and motorists. They reinforce the legitimacy of bicycle traffic on the street, recommend proper bicyclist positioning, and may be configured to offer directional and wayfinding guidance.

Design considerations:

+ Markings provided on roadways with speeds **less than 30 mph**, where there is no opportunity to install dedicated bicycle facilities.
+ Markings are typically positioned a minimum of **10 feet from the curb with on-street parking** and **4 feet from curb without parking**.
+ May be accompanied by "**BIKES MAY USE FULL LANE**" signs.
+ For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

COLORED PAVEMENT MARKINGS

Colored pavement markings within a bicycle lane increase the visibility of the facility, identify potential areas of conflict, and reinforce priority to bicyclists in conflict areas.

Design considerations:

+ Preferred treatment at conflict locations such as driveways, intersections, turn lanes, etc.
+ Typically about the **width of the bicycle lane**. May be solid or dashed and supplemented with bicycle symbols and white edge lines.
+ Material must be high friction surface to reduce skidding when pavement is wet.
+ For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

BICYCLE BOXES

A bicycle box is an area at the head of a traffic lane at a signalized intersection. It provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Bicycle boxes increase visibility of bicyclists and reduce signal delay for bicyclists. Bicycle boxes that extend across an entire intersection can also facilitate bicyclist left turn positioning during red lights.

Design considerations:

- Typically located between the stop line and the crosswalk.
- Typically **10-16 feet in width**.
- For additional design guidance, refer to **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

BICYCLE ROUTE WAYFINDING

A bicycle wayfinding system consists of signing and/or pavement markings to guide bicyclists to their destinations.

Design considerations:

- Used to direct bicyclists to destinations along low-stress routes
- Indicates route direction, destination, and travel distance.
- Relatively inexpensive to implement and maintain.
- For additional guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

TWO-STAGE TURN QUEUE BOXES

A two-stage turn queue box is a designated space for bicyclists to make a turn in two movements, located in front of the crosswalk on a perpendicular street at a signalized intersection. They are typically implemented to help bicyclists make left turns from right-side bike lanes, but could also be used to help bicyclists make right turns from left-side bike lanes.

To turn, bicyclists travel straight through the intersection during a green light, pull right and wait in the queue box. When the cross street receives a green light, the bicyclist proceeds straight through the intersection, completing the turn in two stages.

Design considerations:

+ Provides bicyclists a method to make turns from bicycle facilities.
+ Most important at high-volume signalized intersections where vehicular-style turns are difficult for bicyclists.
+ Typically located at signalized intersections in front of the crosswalks on a perpendicular street.
+ May require explanitory signage for users.
+ For additional design guidance, refer to **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

BICYCLE SIGNALS

Bicycle signals are traffic signals intended for the exclusive use of bicycle traffic and facilitate bicyclists crossing at signalized intersections. They are typically used at complex intersections with unique bicycle traffic patterns that require additional control. Facilities they are applicable to include but are not limited to contra-flow bicycle lanes, separated bicycle lanes, protected bicycle lanes, and two-way separated bicycle lanes.

Design considerations:

+ Ability to provide an exclusive bicycle signal phase.
+ Ability to provide an advance start for cyclists at concurrent signals similar to a Leading Pedestrian Interval.
+ May require education for motorists.
+ For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

BICYCLE DETECTION

Bicycle detectors are installed at signalized intersections to allow traffic signals to detect the presence of bicyclists. Standard loop detectors may not detect bicyclists; therefore, bicycle detectors are recommended where needed.

Design considerations:

+ Required at locations where vehicle detection is installed and bicyclist travel is permitted.
+ May be used to provide bicycle specific signal timings.
+ Typically, signage and pavement markings are used in addition to the bicycle detector.
+ For additional design guidance, refer to **FHWA Manual on Uniform Traffic Control Devices**, **NACTO Urban Bikeway Design Guide** and **AASHTO Guide for the Development of Bicycle Facilities**.

CHAPTER 5

CREATING A BICYCLE NETWORK VISION

OVERVIEW

Providing a bicycle network that is safety-focused, comfortable, connected, and convenient for people of all ages and abilities will help the City achieve the goals set forth in this plan. The planning team conducted a variety of assessments, as outlined in Chapter 1, in order to gather input from residents and visitors and gauge the existing and future bikeability of the city's streets and paths. The result of this input and analysis is the Bicycle Network Vision, a selection of streets and paths in the city which should be prioritized for high-quality bicycle infrastructure improvements. These improvements would take the form of off-street paths, streets with reduced vehicle speed and/or volume, or streets with increased separation for bicyclists from motor vehicle traffic.

In order for the City to achieve its bicycling goals and objectives, the Bicycle Network Vision was developed following three guiding principles:

1. **Safe: People will be able to bicycle in the city without the threat of real or perceived danger from motor vehicles or other people.**

2. **Comfortable: People of all ages and abilities will experience a well-designed, low stress, attractive street and path network.**

3. **Connected: People will be able to use the network to make convenient connections both locally and regionally to the places they need to go for work, school, shopping, and socializing.**

In addition to the network principles, the formulation of the Bicycle Network Vision was based on inputs from the public, the bicycle level of comfort analysis, bicycle count and crash data, and other factors as described throughout this chapter.

PUBLIC INPUT

Nearly 3,000 members of the general public provided comments through a combination of in-person and online forums. Further comments and refinements were received from representatives of the public, including the Cambridge Bicycle Committee, City Council, and City Staff.

Outreach media included flyers, written comment, an online user survey, street teams, two online WikiMaps, two public open houses hosted at the Main Library and Cambridge College, and numerous comments which were written or emailed to City staff. Results of the online user survey are discussed in Chapter 3.

WIKIMAPS

Two WikiMaps, a map-based online survey tool, were used to collect public input. The first WikiMap was aimed at identifying existing conditions: where bicycling improvements are needed and where bicycling conditions are exemplary and should be replicated in other locations, or where they provided an attractive connection. WikiMap users were able to log onto the WikiMap website and indicate where there are great streets or paths, where corridor or spot improvements are needed, and provide comments on existing bicycling infrastructure.

The first WikiMap was open for comments from May to June 2014. A second WikiMap was active from December 2014 to February 2015. This map collected public comment on the Draft Bicycle Network Vision. Users provided text comments and ranked the importance of streets in the Draft Network, and suggested additional streets or paths which were not included in the Draft. Approximately 1,113 users logged onto the WikiMaps and generated 995 comments. Figure 5.1 and Figure 5.2 show a summary of the first WikiMap results and were used during the development of the Bicycle Network Vision to identify locations deemed important by the public.

Figure 5.1: WikiMap 1 Comment Frequency by Location: Improvement Needed

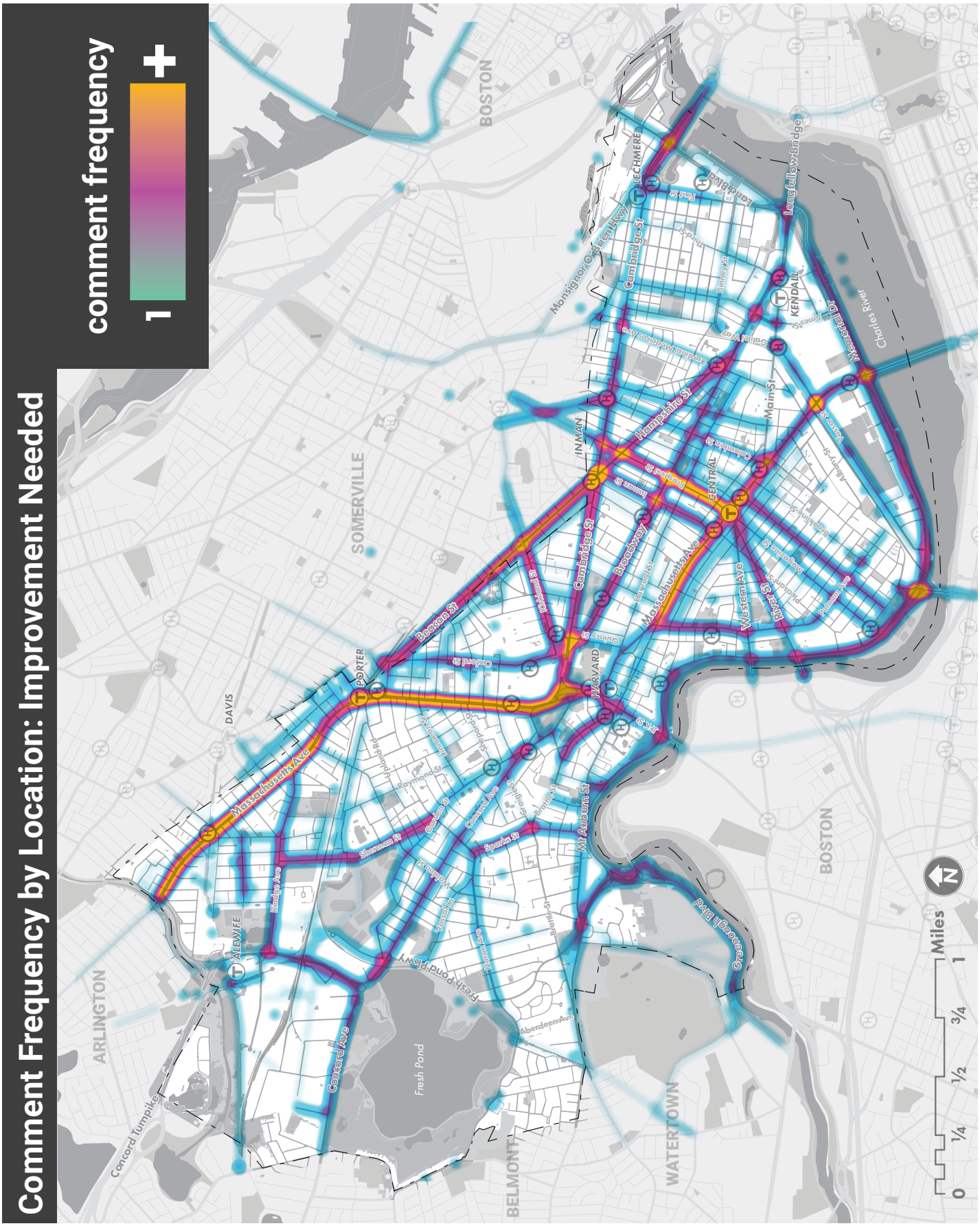
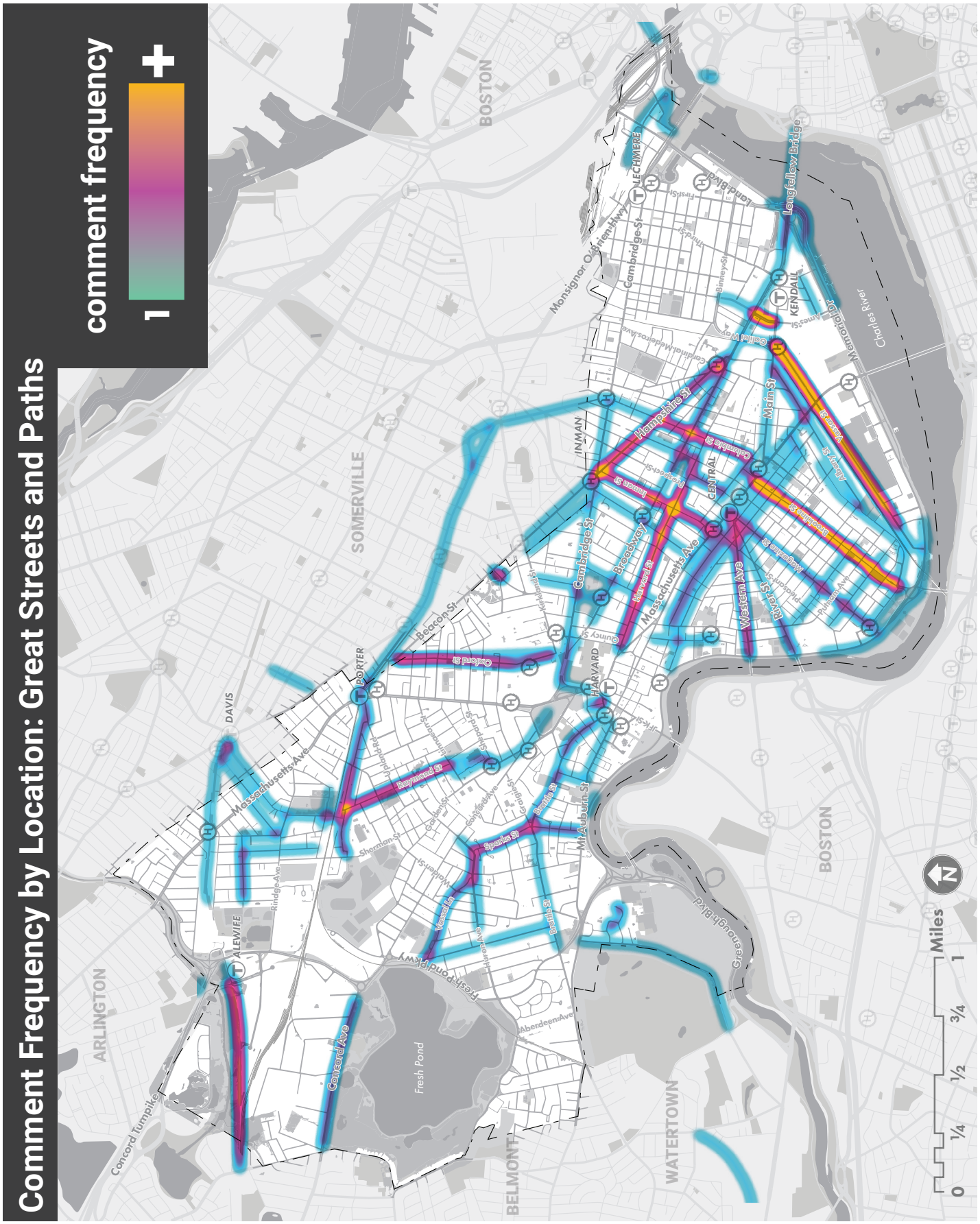


Figure 5.2: WikiMap 1 Comment Frequency by Location: Great Streets and Paths



OPEN HOUSES

The first public open house was held on Thursday, June 12, 2014 at the Main Library. Approximately 60 people attended the open house. A number of stations were established for visitors to speak with Bicycle Program staff, respond to the online user survey, provide comments on a live WikiMap, discuss potential bicycle facility types, review the Bicycle Level of Comfort Analysis and bicycle crash trends, and discuss capital improvement projects with Public Works staff.

The second public open house was held on December 4, 2014 at Cambridge College. The event was attended by nearly 100 people. This event followed the same format as the first open house, but included the opportunity to review and comment on the Draft Bicycle Network Vision.

Additionally, large scale paper maps of the existing bicycle network were presented at 20 public events throughout 2014. Attendees were encouraged to identify and comment on locations in the city where bicycling issues need to be addressed. These paper-based comments were then compiled digitally with WikiMap comments to provide a database of needs to be addressed in this Plan.

BICYCLE LEVEL OF COMFORT

The Cambridge Bicycle Level of Comfort Analysis (BLC) is a planning tool used to quantify the level of comfort that a person bicycling is likely to perceive while riding on any street or path. The analysis correlates comfort with the physical and operational characteristics of roadways and crossings. It is based on the premise that a person's level of comfort on a bicycle increases as separation from vehicular traffic increases and as traffic volume and speed decrease. The result of the analysis is a numerical comfort ranking for every street and path in the city, from greatest comfort (BLC 1) to least comfort (BLC 5).

The BLC Analysis is the foundation of the Bicycle Network Vision. It allowed the planning team first to identify existing assets, by determining a network of comfortable streets on which people bicycle, and second to prioritize infrastructure improvements by closing critical gaps in the high-comfort network. This approach recognizes that the city's bicycle network is not just a handful of streets with bicycle-specific infrastructure, but rather every street is a potential route for bicyclists who have varying tolerances for the stress caused by biking near motor vehicles.

METHODOLOGY

The BLC Analysis is based on the Mineta Transportation Institute's pioneering research on Low-stress bicycling and network connectivity.[1] The Cambridge BLC used Mineta's ranking criteria for Level of Traffic Stress (analogous to BLC) as a baseline for the comfort ranking of each street or path. The analysis uses a weakest link principle to score road segments, recognizing that a bicycle route is only as appealing as its least comfortable or highest stress feature.

Following an initial stage of analysis, BLC rankings were vetted by City Staff, the City's Bicycle Committee, and the public to test the accuracy of the model. This ensured that the results matched with the actual experience of people most familiar with roadway conditions. Based on this feedback, the model was refined using additional criteria specific to Cambridge. This included ranking criteria such as narrow one-way, single-travel-lane streets with parking on two-sides, streets with high-frequency bus routes, and the addition of a fifth level of comfort to address state highways. For specific ranking criteria see Appendix D. Ultimately, each street or path in the city received a BLC ranking from 1-5, described below.

It should be noted that a large amount of data about each street was collected from a variety of sources, but certain values had to be assumed due to the unavailability of data. In particular, roadway volume and speed data were not available on many residential/local roadways. Values typical of local roadways were assumed for these streets, resulting in typically low stress rankings. Nevertheless, many of these streets may be less comfortable than the analysis suggests, due to actual volume and speed being higher than assumed.

The BLC analysis attempts to provide a general assessment of bicycling comfort, and as a result does not take into account factors that are of a seasonal or temporary nature. As a result pavement quality and accumulation of precipitation are not considered in the BLC. While surface quality can be a significant factor in bicycling comfort, it is typically not a permanent feature and often too dispersed along a roadway to affect the comfort of the entire corridor. Additionally, fluctuation in vehicle speed and volume at peak travel hours is not reflected in the analysis. A particular roadway may be comfortable for much of the day, but very uncomfortable during peak hours due to substantial increases in traffic.

BLC 1

Who: Your grandmother who enjoys riding to errands on Sunday afternoons; a young family of four, with the youngest child in a bicycle seat up front followed by his sister riding behind on her first bicycle; or you - enjoying a slow, quiet ride through your neighborhood.

What: Places where only people on bicycles or foot are allowed, like off-street paths or separated bicycle facilities; quiet neighborhood streets with only occasional vehicular traffic travelling at low speeds.

Where: Minuteman Commuter Bikeway; North Point Park path systems; Western Avenue cycle track, Spring Street.

BLC 2

Who: Your friends from out of town who have never ridden a bike on city streets; a Hubway rider who hasn't been on a bike in years but would like to give it a try; your son, a student at Cambridge Rindge & Latin, who rides to Danehy Park after school for soccer practice.

What: Neighborhood streets with some traffic, not travelling too fast; bike lanes against the curb; wide bike lanes on streets without much traffic that make travel predictable for people in cars and on bikes.

Where: Brookline Street, Richdale Avenue.

BLC 3

Who: Your neighbor, who diligently takes out her bike each morning to make the trip to work; MIT students riding for ice cream after class for a group study session; your friend from Somerville who rides to the supermarket every week for groceries.

What: Roads with frequent car traffic that may travel fast at times; bicycle lanes that are often blocked by vehicles – whether trucks making deliveries, cars pulling in an out of parking spaces, or car doors opening into the adjacent bicycle lane; narrow, often one-way, single-lane streets with frequent car traffic that can't pass bicyclists due to parking on either side.

Where: Cambridge Street, Magazine Street, Pearl Street.

BLC 4

Who: The bartender working in Central square whose bike messenger days are behind him; your cousin who rides to her job in Kendall Square from Arlington, rain or shine.

What: Roads that have fast and/or constant motor vehicle traffic and no bicycle lane; streets with steady bus traffic making frequent stops; bicycle lanes that are often blocked by illegal parking.

Where: Massachusetts Avenue, Prospect Street.

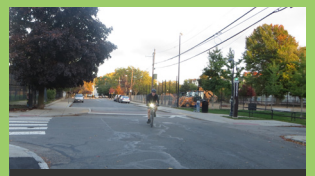
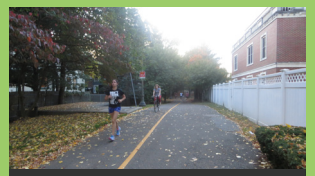
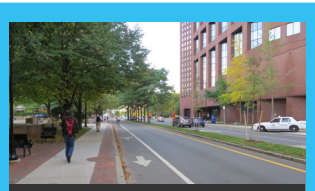
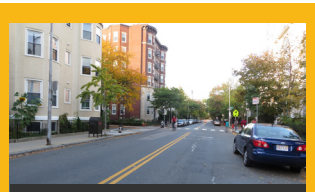
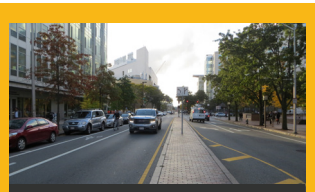
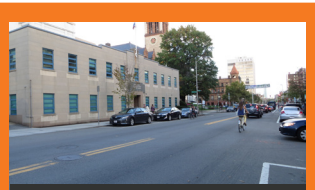
BLC 5

Who: Your coworker who rides his top-of-the line road bike out to Lexington every weekend for a half-century.

What: Roads designed as highways, meant to carry extremely high volumes of very fast moving motor vehicle traffic travelling between cities.

Where: Memorial Drive, Fresh Pond Parkway.

Figure 5.3: Bicycle Level of Comfort Criteria and Examples

BICYCLE LEVEL OF COMFORT	TYPICAL CRITERIA	EXAMPLES		
1	Protected/Separated or Shared with ADT <2K or Shared with Speed <30 mph	 Pemberton Street	 Community Path	 Vassar Street
2	Wide/Buffered Bike Lane or Bike Lane w/out Parking adjacent or Shared with ADT 2-4K or Shared with Speed <30 mph	 Richdale Avenue	 Broadway	
3	Bike Lane adjacent to Parking or Shared with Speed 30 mph or Shared with ADT 4-6K or Narrow Operating Space	 Magazine Street	 Main Street	
4	Shared with Speed 30+ mph or Shared with ADT 6-15K or High Frequency Bus Route	 Massachusetts Avenue	 Broadway	
5	Shared with Speed 35+ mph or Shared with ADT 15+K and No Parking and 2+ Travel Lanes per direction	 Land Boulevard	 O'Brien Highway /Route 28	

FINDINGS

1. Shared use paths provide continuous high-quality regional connections, but often only at the edges of the city. Separated bike lanes on Vassar Street and Western Avenue connect bicyclists between paths and commercial, institutional, and employment centers on high-comfort routes. However, in general, routes connecting regional paths to destinations are not high-comfort.

2. BLC 1 and 2 streets/paths represent twice the mileage (appx. 140 miles) of BLC 3, 4, and 5 streets/paths combined (appx. 70 miles). BLC 1 and 2 streets, however, do not form a cohesive network of continuous high-comfort bicycle routes. They are fragmented by low comfort (BLC 3, 4, 5) streets, particularly around commercial and employment centers. Sometimes an otherwise good street has a barrier such as a difficult intersection. For example, Vassar Street's otherwise high comfort is not really continuous, as the major intersections are barriers. Fragmentation is also increased due to many local streets operating in a discontinuous one-way street pattern. High comfort streets that physically connect often do not provide a continuously bikeable route due to frequent changes in the direction of operation.

3. Most primary roads in Cambridge that provide access to commercial, institutional, and employment centers do not provide a comfortable biking experience (BLC 3, 4, or 5). These streets, such as Massachusetts Avenue, Broadway, Cambridge Street, and Concord Avenue, are in high demand by all modes of traffic, but may act as barriers for people who are not comfortable riding in such conditions. Often these streets are the only route to major activity centers aside from alternatives that require a significant detour. Finally, these streets and their intersection with other BLC 3-4 streets are also locations with the highest frequency of bicycle crashes. Such locations include Central and Inman Squares, the northern section of Massachusetts Avenue, and the major intersections of Cambridge Street and Broadway.

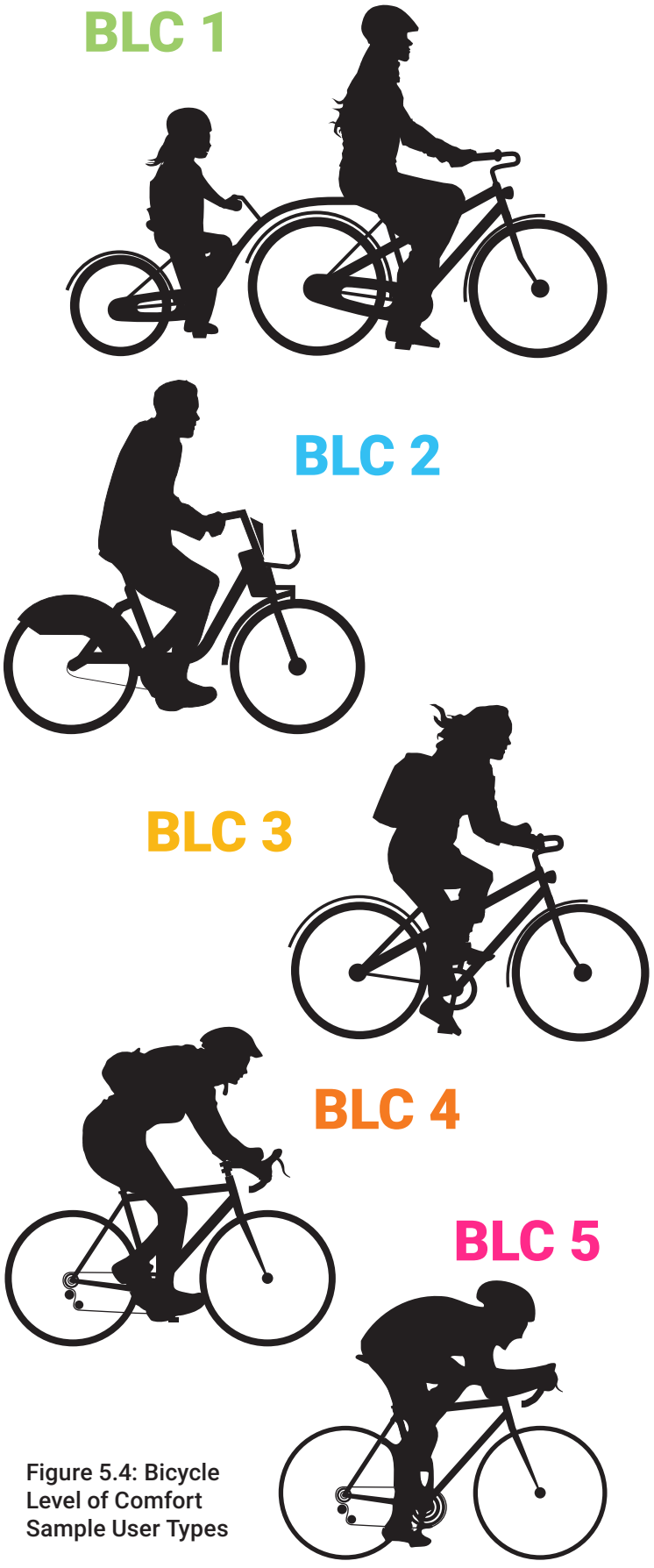


Figure 5.4: Bicycle Level of Comfort Sample User Types

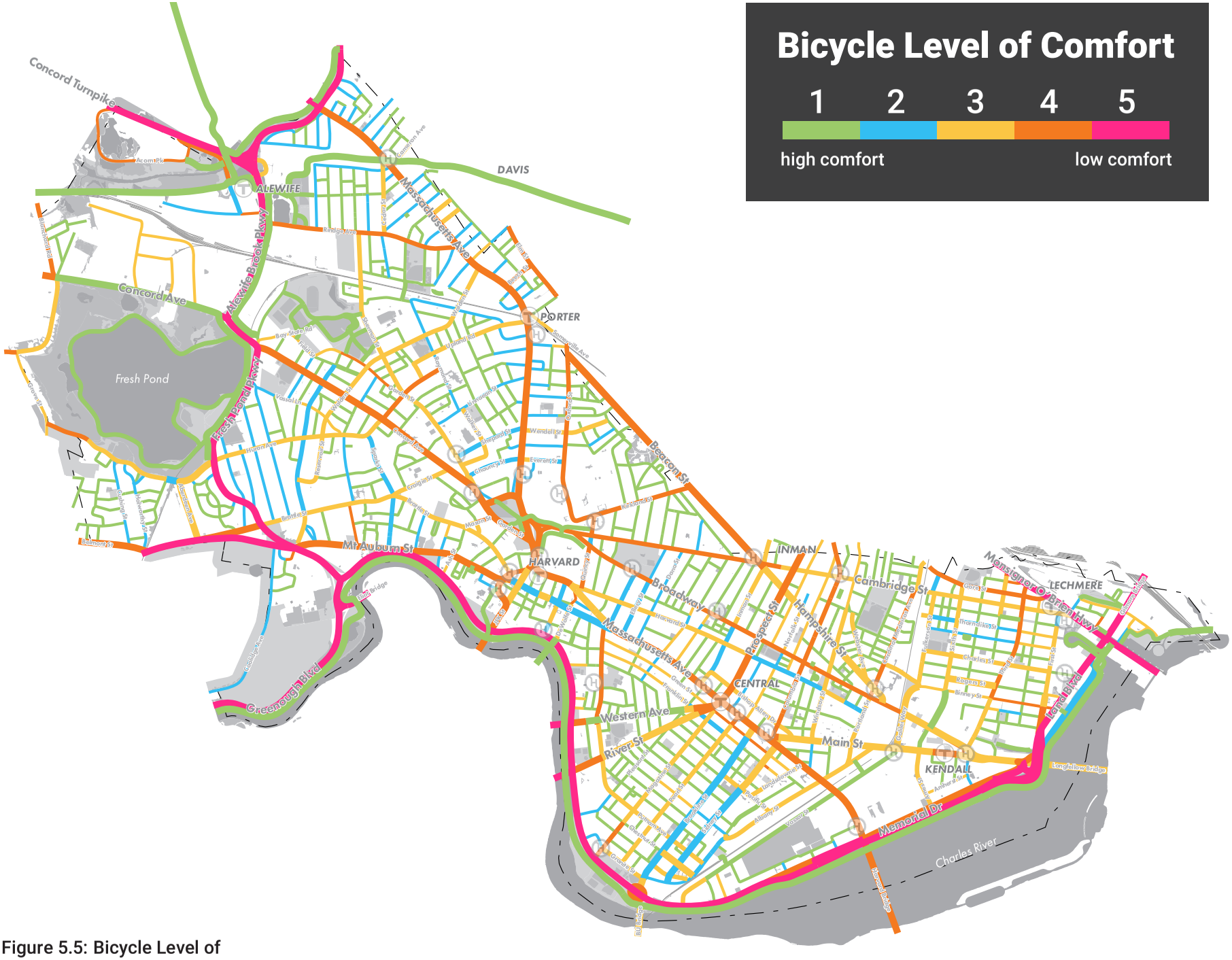


Figure 5.5: Bicycle Level of Comfort Analysis: BLC 1-5

Figure 5.6: Bicycle Level of Comfort Analysis: BLC 1 & BLC 2

BICYCLE COUNTS AND CRASH DATA

Cambridge conducts biennial bicycle counts and analyzes bicycle crash data collected from the Cambridge Police Department crash reports. Both data sources were used in the development of the Bicycle Network Vision. Details on bicycle counts and crashes are discussed in Chapter 3.

LEVEL OF ACCOMMODATION

Infrastructure recommendations in the Bicycle Network Vision take the form of a "level-of accommodation" for each street or path. These recommendations do not propose specific facility types, rather they provide infrastructure goals for each street or path which may be reached through a variety of design treatments. Specific bicycle facility types, as provided in Chapter 4, will be determined through a design process for each street/path which will include public outreach and will be informed by the latest best practices in bicycle infrastructure design at that time.

Since streets have different characteristics and functions, different street types need different levels of accommodation. Busy commercial streets like Massachusetts Avenue typically require separation from vehicular traffic and parking in order to provide comfort and safety for all users. Quieter residential streets like Harvard Street often benefit from lowering the speed and/or motor vehicle volume through traffic calming so that bicyclists are more safe and comfortable sharing the road.

The proposed levels of accommodations are:

1. **Off-street:** Paths, primarily through parks or open space and along linear corridors such as rail lines and rivers – motor vehicle traffic is prohibited.

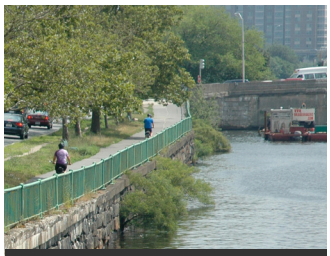
2. **Separated:** Physical separation from traffic with raised bicycle lanes, protected bicycle lanes, or other means which provide a vertical and horizontal barrier between bicyclists and motor vehicles. Separation is required primarily on major through-streets with higher traffic volumes and speeds. These streets often provide access to shopping, jobs, neighboring communities, and regional trails.

3. **Lower volume and/or speed:** Lower motor vehicle volume and/or speed with bicycle-friendly traffic calming, priority crossing treatments, or other traffic calming strategies, primarily on residential and less busy through-streets. These streets often provide access within and between neighborhoods, local parks, or schools.

Tools for Creating Off-Street Paths

Right-of-way

Rails-to-trails

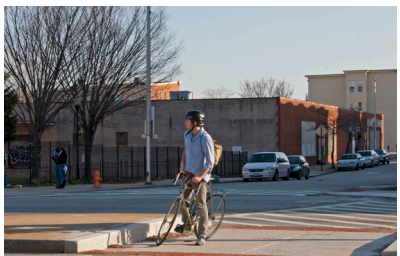

Waterways

Parks

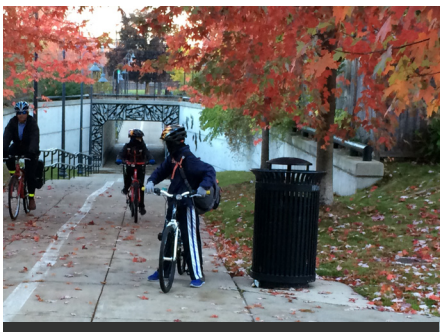
Parkways

Crossings

Stop Controlled


Crossing Islands

Signal Controlled


Grade Separation

Advisory Signage

Operation

Shared Use

Horizontal Bike/ped Separation

Vertical Bike/ped Separation

Amenities

Wayside Amenities

Wayfinding

Lighting

Figure 5.7: Level of Accommodation Example for Off-Street Paths

Tools for Creating Separation

Separation

Plastic Flexposts

Concrete Buffer

Landscaping

Planters

Level

Sidewalk Level

Roadway Level

Intersections

Protected Intersections

Signal Separation

Mixing Zones

Operation

One-Way

Two-Way

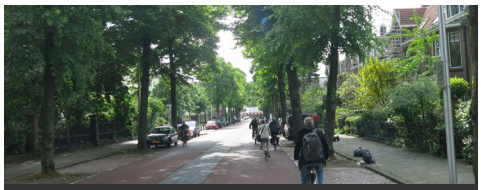
Figure 5.8: Level of Accommodation Example for Separated Bike Lanes

Tools for Creating
Lower Volumes and/or Speeds

Low Volume

Full Traffic Diverter

Half Traffic Diverter

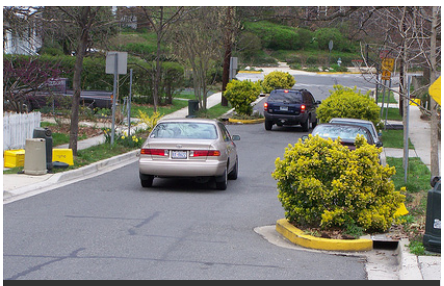


Bicycle Priority Street

Slow Speeds

Mini Traffic Circle

Green Street

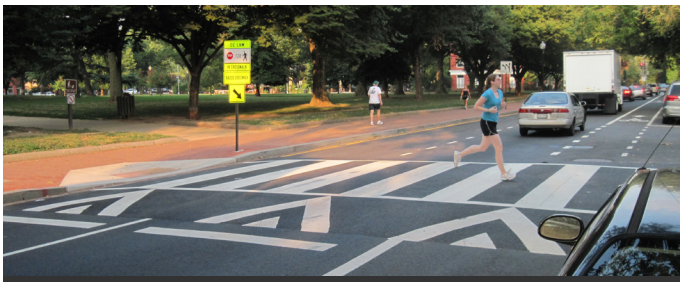


Landscaped Chicanes

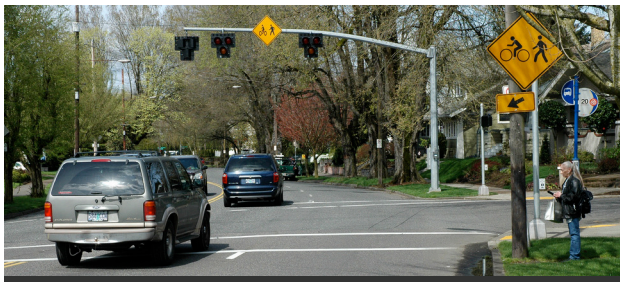
Curbside Community Gardening

Rain Garden Neckdown

Safe Crossings



Raised Crosswalk



Pedestrian- and Bicycle-only Signal

Branding

Wayfinding Signage

Street Art

Pavement Markings

Figure 5.9: Level of Accommodation Example for Volume and Speed Reduction

BICYCLE NETWORK VISION

The development of a comfortable, safe and connected bicycle network is an important step for Cambridge.

The 115-mile Bicycle Network Vision is best understood as a series of layers – starting with existing or high-comfort bicycle facilities (Figure A) and projects currently in-design or under-construction (Figure B). The existing network was assessed by its ability to connect people riding bicycles comfortably to key destinations including jobs, shopping, open space, and schools. In addition to land use, public comments, the BLC analysis, crash data, and other roadway conditions were utilized to determine where gaps exist in the current bicycle network and what major routes or desire lines for bicyclists need improved accommodation. Utilizing this assessment of existing conditions, the process of building the network focused on providing high-comfort routes between all major origins and destinations in the city.

Proposed off-street paths (Figure C) includes those paths which are envisioned to provide greater connectivity to the regional trail network. Streets proposed for increased separation (Figure D) represent mostly major streets and primary connections to destinations. Streets proposed for lower volume and/or speed (Figure E) mainly represent neighborhood and school connections. The resulting network is a long term vision for a safe, comfortable and connected network of streets and paths that seamlessly links key destinations throughout the city.

While all streets in Cambridge are used by bicyclists, the Bicycle Network Vision will prioritize the funding, redesign, reconstruction, and maintenance of projects to promote the completion of a connected high-comfort network (BLC 1 & 2) that provides a bicycling option for people of all ages and abilities. Improvements will continue to be made to other streets as opportunities arise. For example, adding shared lane markings to Broadway from Prospect Street to Portland Street improved the bicycling conditions but did not bring the street to a BLC 1 or 2. The Bicycle Network Vision will be a living document, updated regularly as new ideas and opportunities emerge.

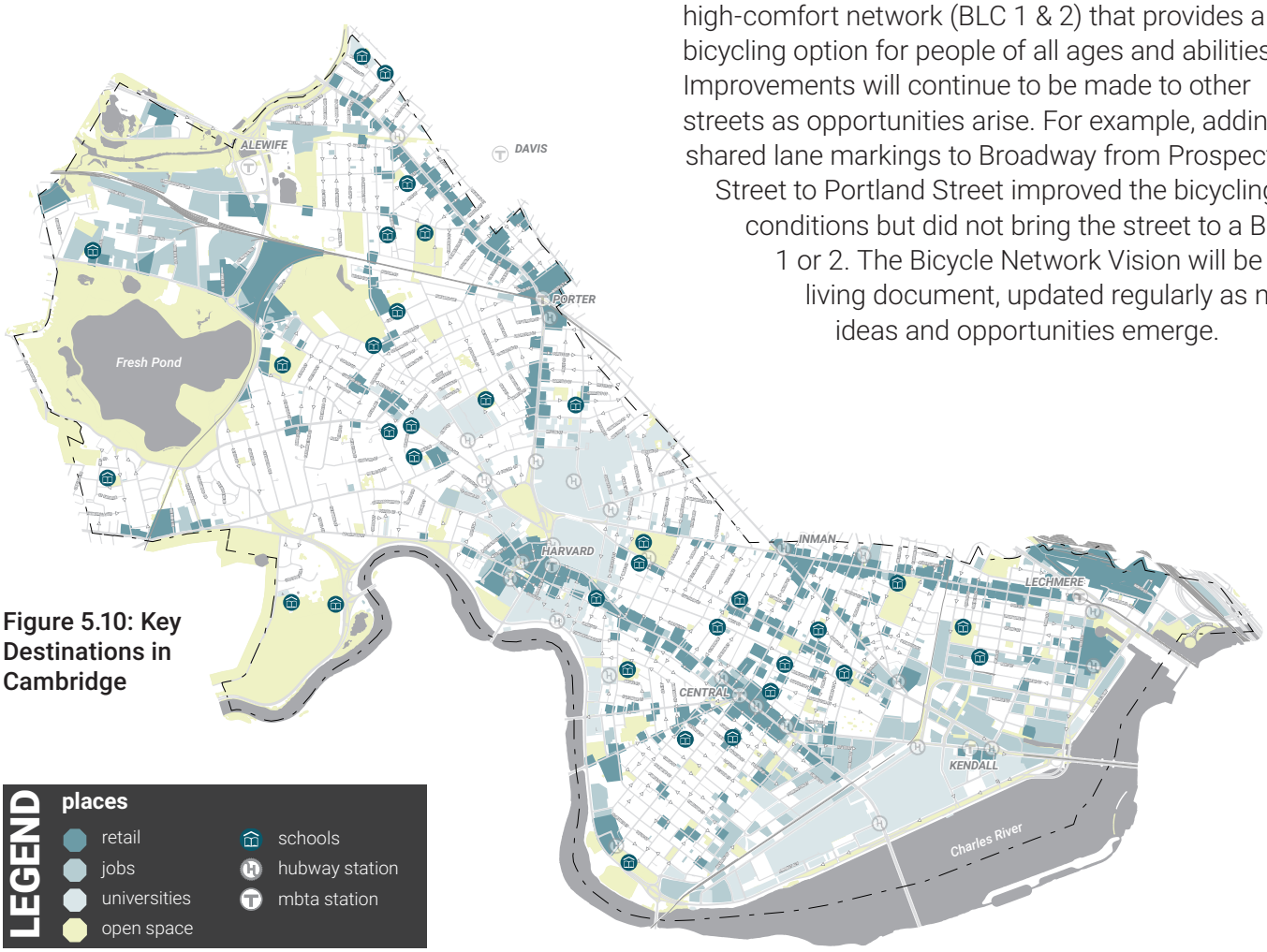


Figure 5.10: Key Destinations in Cambridge

Existing Bicycle Network

A

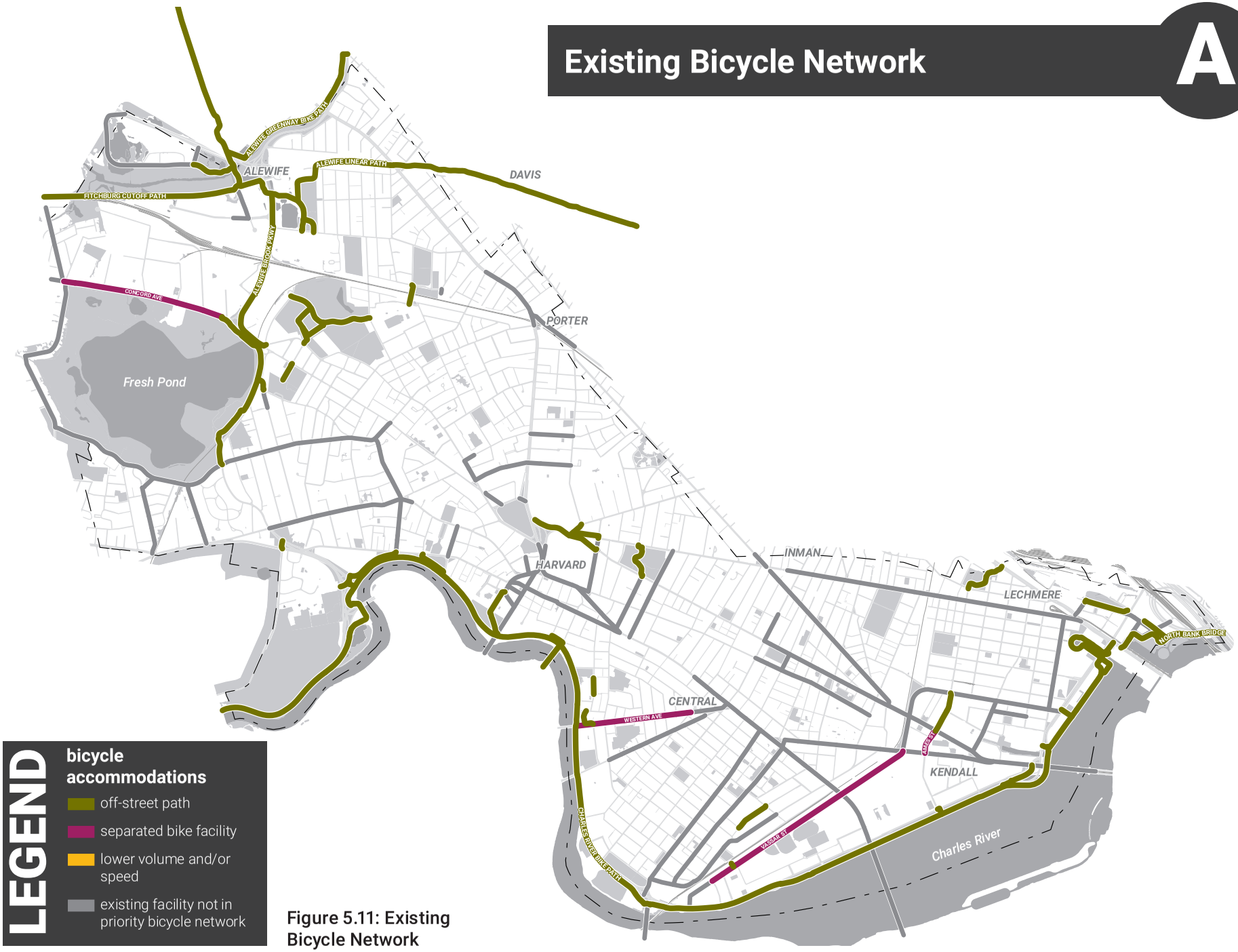
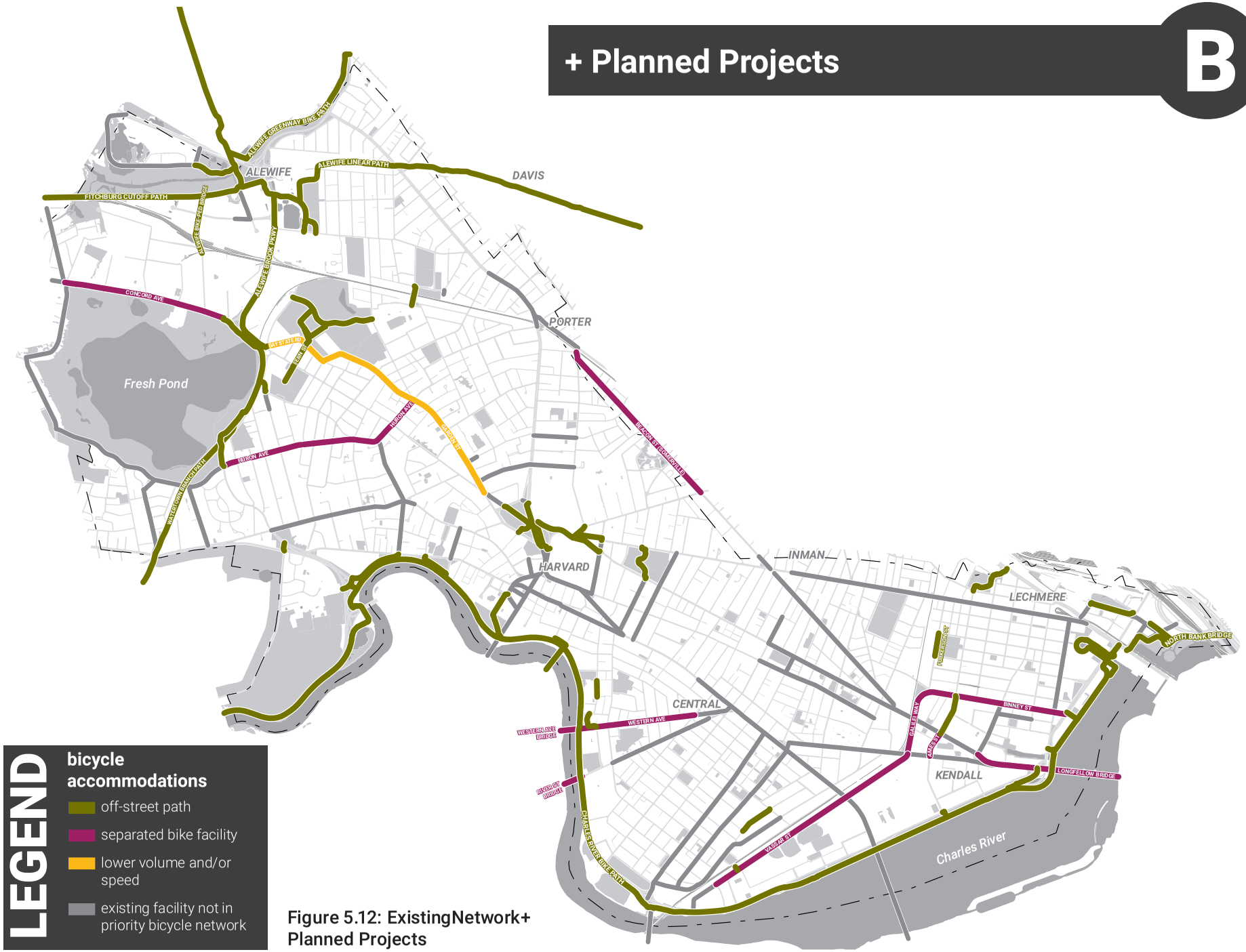


Figure 5.11: Existing Bicycle Network

+ Planned Projects

B



LEGEND

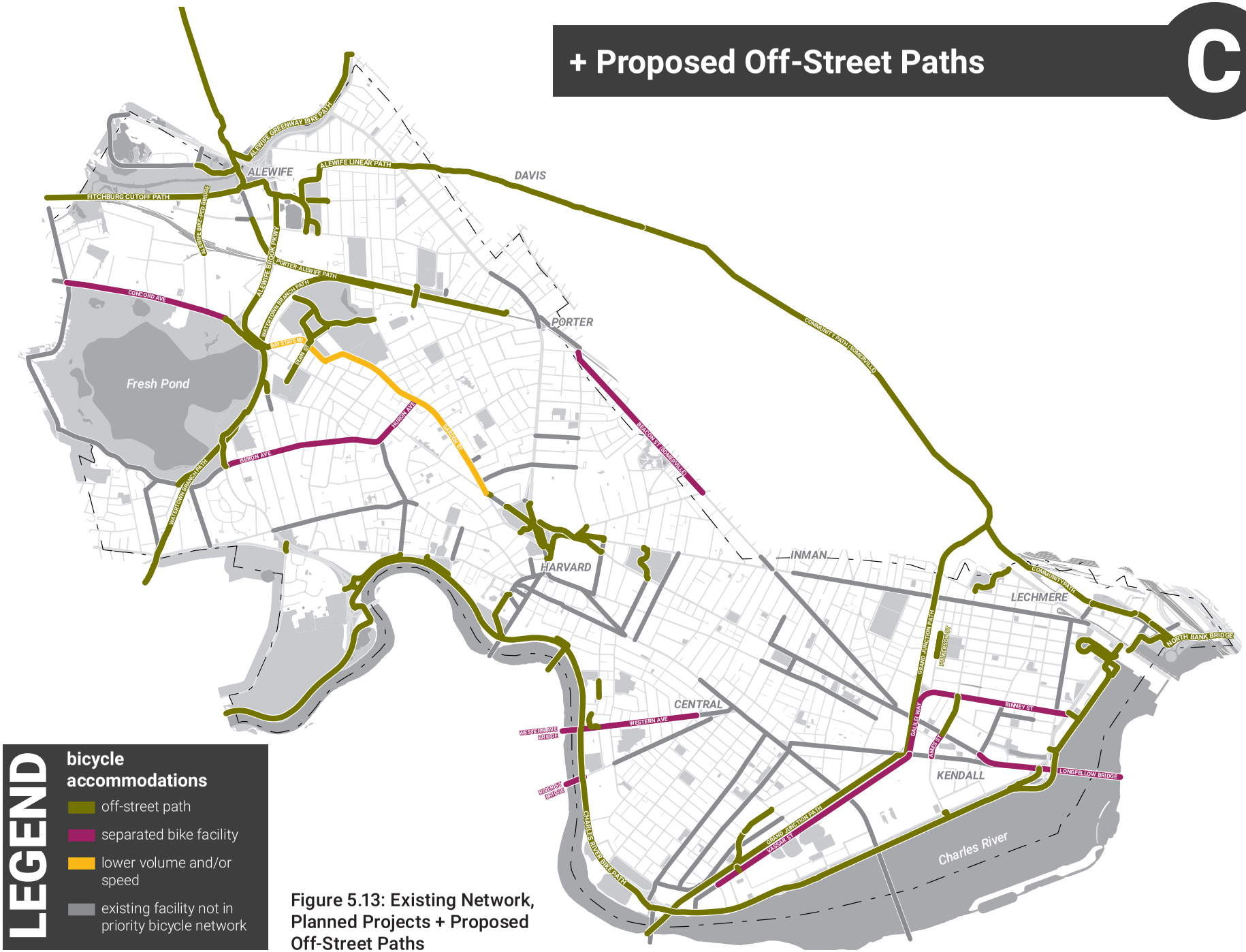
bicycle accommodations

- off-street path
- separated bike facility
- lower volume and/or speed
- existing facility not in priority bicycle network

Figure 5.12: ExistingNetwork+ Planned Projects

+ Proposed Off-Street Paths

C



LEGEND

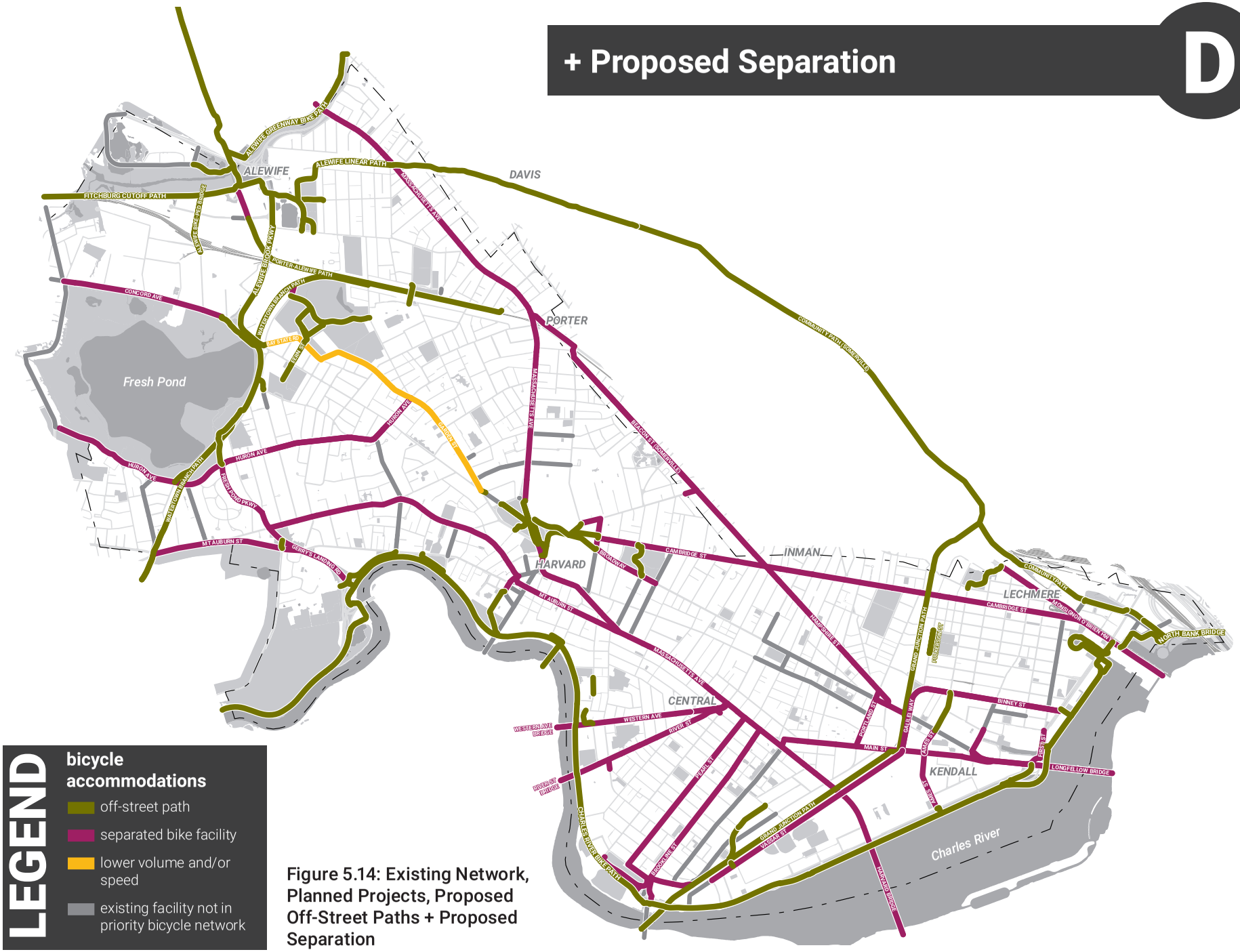
bicycle accommodations

- off-street path
- separated bike facility
- lower volume and/or speed
- existing facility not in priority bicycle network

Figure 5.13: Existing Network, Planned Projects + Proposed Off-Street Paths

+ Proposed Separation

D



LEGEND

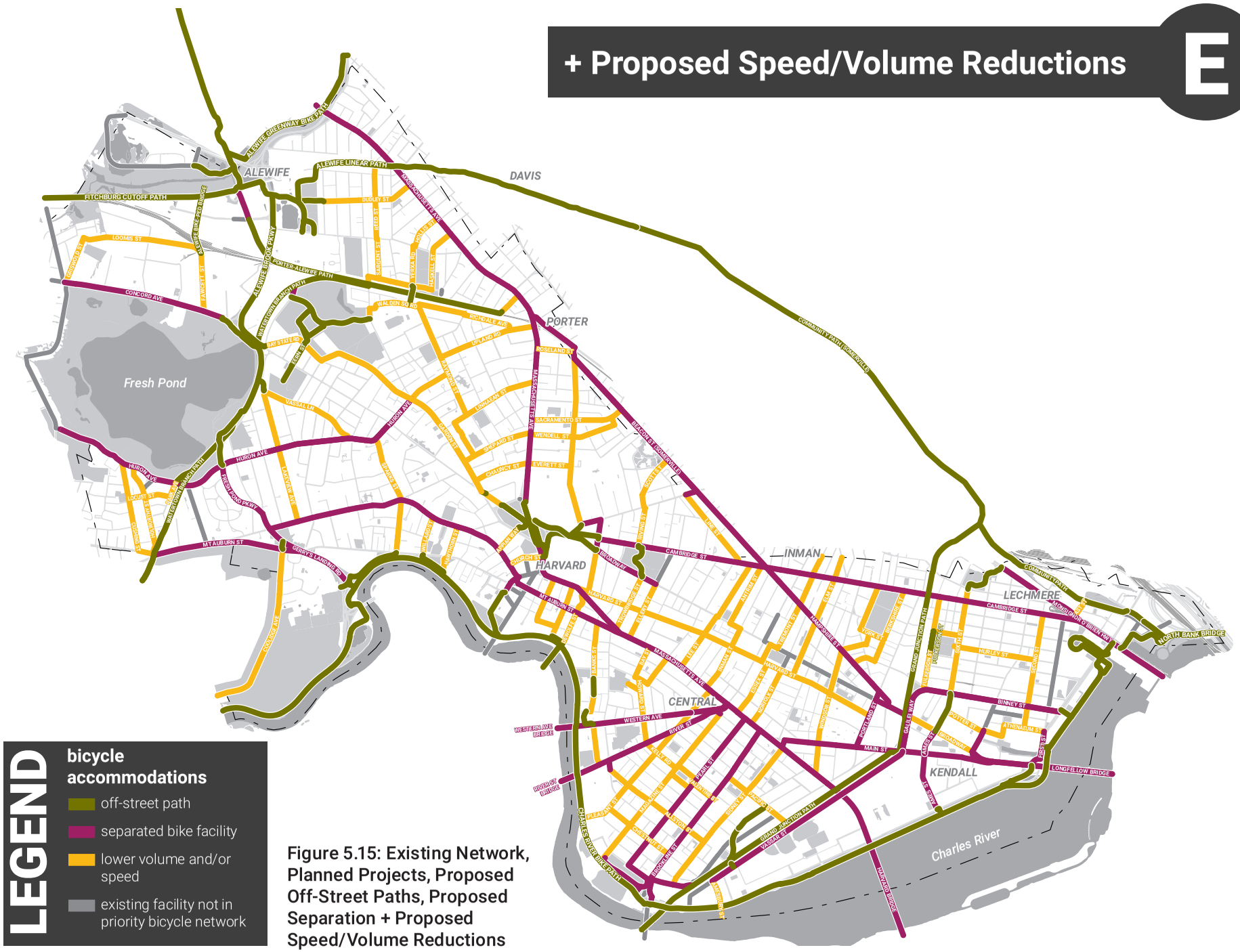
bicycle accommodations

- off-street path
- separated bike facility
- lower volume and/or speed
- existing facility not in priority bicycle network

Figure 5.14: Existing Network, Planned Projects, Proposed Off-Street Paths + Proposed Separation

+ Proposed Speed/Volume Reductions

E



LEGEND

bicycle accommodations

- off-street path
- separated bike facility
- lower volume and/or speed
- existing facility not in priority bicycle network

Figure 5.15: Existing Network, Planned Projects, Proposed Off-Street Paths, Proposed Separation + Proposed Speed/Volume Reductions

Bicycle Network Vision with Key Destinations

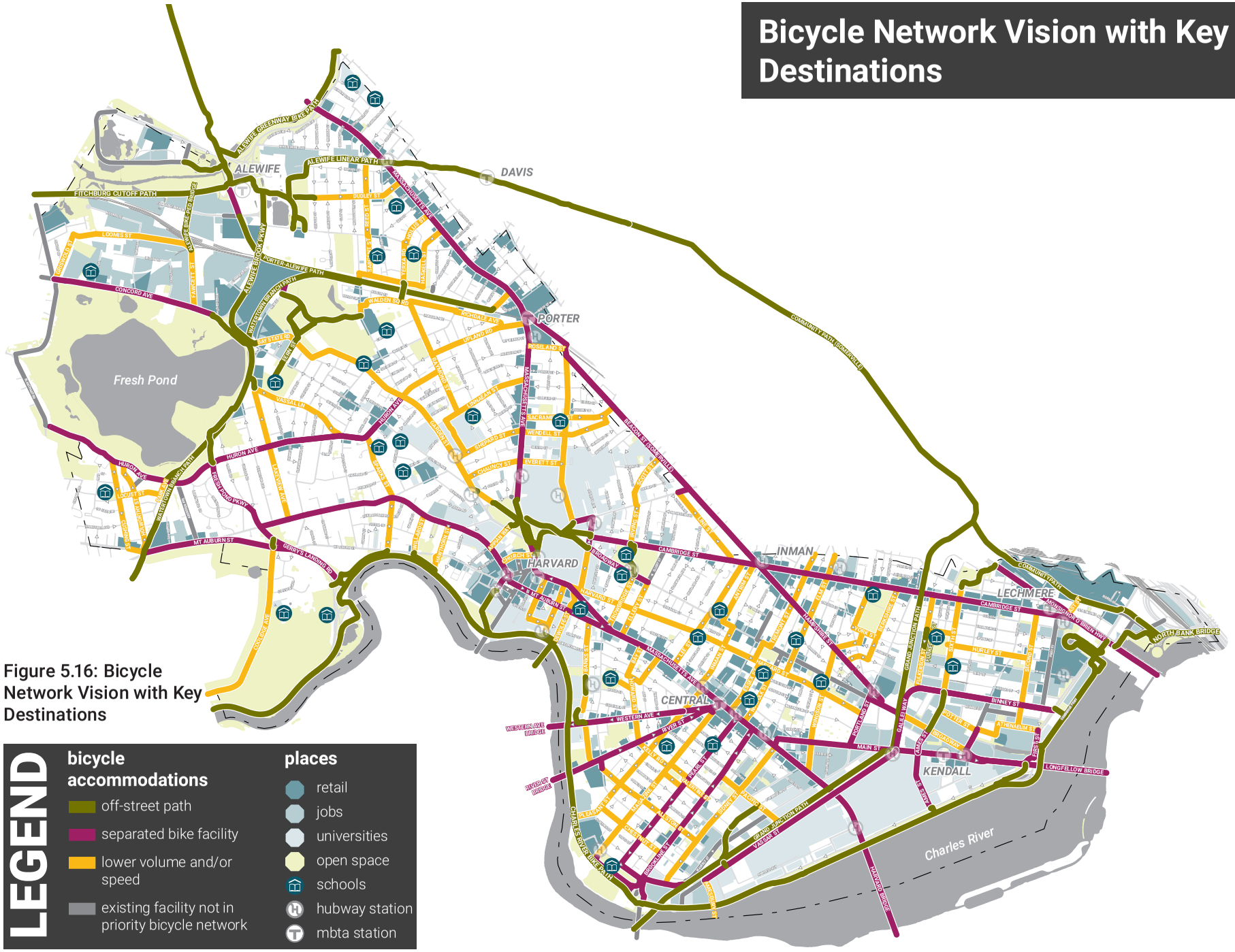


Figure 5.16: Bicycle Network Vision with Key Destinations

ENDNOTES

1 Mekuria, M., Furth, P., and Nixon, H., Low-stress bicycling and network connectivity, Mineta Transportation Institute (2012).

CHAPTER 6

BICYCLE PROGRAMS

OVERVIEW

Cambridge promotes bicycling through a variety of programs and interventions in addition to establishing a supportive physical environment. These include outreach to encourage safe travel, whether by car, bike or on foot; a community based marketing program; zoning requirements to ensure that new development in the city is bicycle-friendly; a parking and transportation demand management program to reduce use of single-occupancy vehicles; and coordination amongst City departments to address issues related to bicycling.

Cambridge is a collaborative community; there are a several coordinating councils and committees to ensure that the efforts consider the full scope of planning, education and outreach efforts around transportation. Some of the standing entities are described below, but much of the work that is undertaken routinely involves interagency efforts. In addition, the City works with residents, businesses and institutions who are important partners in our efforts.

COMMUNITY OUTREACH PROGRAMS

EDUCATION

Cambridge works to enable people to make effective choices and to travel safely. Education covers expected topics such as how to ride a bike, what signs and signals mean, and what the rules of the road are. It is also important to provide information about how transportation networks function, and how transportation is connected to other issues such as energy use, climate change, personal and public health, and the livability of a community.

FOR PEOPLE WHO DRIVE

While driver education is fundamentally critical to the safety of people on bikes, unfortunately, most driver education programs in the United States are inadequate when it comes to teaching people how to operate motor vehicles safely around people

walking or bicycling. This is a problem nation-wide and is difficult for any single municipality to make significant inroads, as driver education falls under state jurisdiction. Enhanced motorist education that teaches how to look for and interact with bicyclists should be part of the driver education curriculum.[1] Cambridge engages in outreach and education campaigns to reach as many drivers as possible; some of these efforts are described below.

FOR PEOPLE WHO BIKE

When people bicycle, they also need to know the traffic laws and develop good bicycling skills. Cambridge provides the resources towards that end, for both children and adults. In addition to creating outreach and educational materials geared towards bicycling, the City hosts free workshops and skill-building sessions for the public and for City employees, and provides support for private entities engaged in outreach. Also addressed are important tips on how to travel safely around motor vehicles and how to be mindful and careful around people walking.

EDUCATIONAL MATERIALS AND FUNCTIONAL GIVEAWAYS

GETTING AROUND CAMBRIDGE MAPS

This free map serves as the City's primary educational piece for people who bike, walk, use transit or drive in Cambridge. Included is information about sharing the road, bicycle lanes, signals, real-time tracking for transit, rules and regulations, paying for parking, and more.

BICYCLING IN CAMBRIDGE, WALK THIS WAY, USING PUBLIC TRANSIT, AND WATCH FOR BIKES BROCHURES

Cambridge hosts a robust marketing campaign to demonstrate just how easy it is to get around town without driving alone. These brochures are distributed at community events, sold at cost to developers and institutions, and posted at City buildings for the public to take.

GIVEAWAYS

Cambridge's approach is to make the free promotional materials, distributed at community events, functional and educational. These giveaways include bicycle lights, reflective leg bands, bells, tire patch kits, activity books, reflective vests; people who take workshops are eligible for free helmets.

RESIDENT PARKING PERMITS

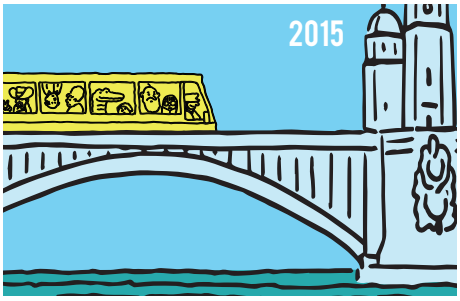
Bicycle safety information is included in the residential permit parking packet by Traffic, Parking & Transportation.

"WATCH FOR BIKES" DECALS

Small decals with the saying "Watch for Bikes" are distributed all around Cambridge to people who drive cars. These decals should be installed on the side and/or rear view mirrors to remind people driving cars to look for people on bikes before opening a car door. These are distributed at community events and are installed on the passenger windows of taxi cabs in Cambridge. Installation on cabs has become institutionalized, and is part of the biannual inspection undertaken by the Cambridge License Commission. Brochures with this important message have been included in citywide mailings and in the Traffic, Parking & Transportation brochure that is given to everyone receiving a parking sticker or visitor permit.

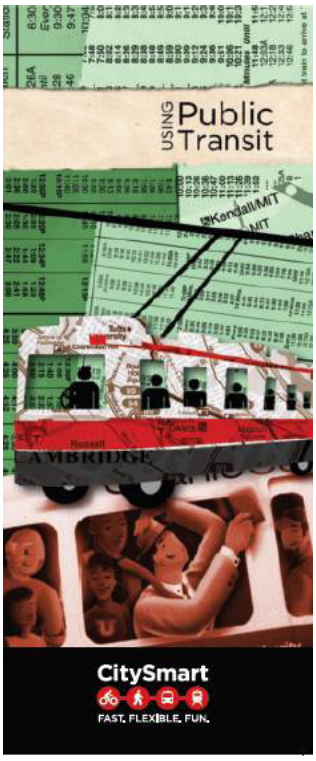
Figure 6.1: Examples of educational materials

GETTING AROUND
CAMBRIDGE



WATCH FOR BIKES

TIPS FOR SHARING THE ROAD

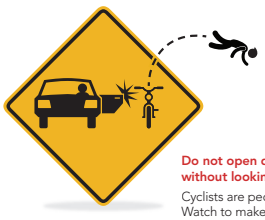


TOP 5 MOST DANGEROUS THINGS TO DO ON THE ROAD

1

Do not talk or text while driving.
Put the phone down and focus on the road.

2



Do not open door without looking.
Cyclists are people, too. Watch to make sure you don't hit people on bikes when opening your car door.

3

Do not stop in the bike lane.
The road is for everyone. Stay clear of bike lanes and don't double park.

4

Stop for people walking.
Pedestrians are not bowling pins. Stop for them at crosswalks.

5

Watch carefully when turning right and left.
Yield to people biking and walking before turning.

SOCIAL MEDIA, ONLINE PRESENCE AND TRADITIONAL MEDIA

MEDIA OUTLETS

Opportunities for reaching people through various media outlets are used, including outreach to local and regional media to publicize information on and promotion of bicycling in the community.

VIDEOS

Videos are sometimes used to provide more lively informational pieces. For example, the Cambridge Police Department created a video on traffic safety, with a specific emphasis on bikes, and the Food and Fitness Policy Council created a short video with Cambridge Community Television on active transportation as a good source of physical activity in Cambridge. More information can be found at http://www.cctvcambridge.org/healthheroes.

SOCIAL MEDIA AND ONLINE PRESENCE

Cambridge strives to engage with people who live, work and play in the city in as many ways as we are able. A wealth of information is available through the City website, particularly at www.cambridgema.gov/bike. This site hosts educational information, bike workshop dates, information on trends in bicycling, and much more. Relevant information is posted daily on Facebook, Twitter, Instagram and Tumblr to reach people who may not typically participate in community meetings about transportation.

Figure 6.2: Examples of educational materials available at www.cambridgema.gov/bike

COMMUNITY EVENTS, HUBWAY PSA'S, AND OTHER ENGAGEMENT

COMMUNITY EVENTS

There are many opportunities for reaching the public in Cambridge at City-sponsored events, including Danehy Park Family Day, Fresh Pond Day, Bike Month in May, the Cambridge Science Festival, and Walk/Ride Days.[2] City staff and volunteers staff community engagement tables, handing out information, asking for feedback, giving away freebies such as bike lights and bells, and engaging with young people by playing educational games.

PARK(ING) DAY

The Community Development Department hosts an entire day devoted to engaging the community in transforming parking spaces into something else for the day. The goal of this international event is to allow the community to realize just how much space a parking spot takes up, and to explore other possible uses of that precious real estate. Several bicycle-related spots have been hosted in the past, including bicycle tune-ups, pop-up bike lanes, and bicycle parking.

HUBWAY PUBLIC SERVICE ANNOUNCEMENTS

The map panels of the Hubway Bike Share stations provide space on one side for Public Service Announcements (PSAs), and the City has used this opportunity to promote sustainable transportation, energy efficiency, and Hubway itself. In 2015, a special campaign was launched based on feedback received through an outreach project, to focus on showing the diversity of people who bike in Cambridge.[3]

BROADENING COMMUNITY ENGAGEMENT

Cambridge has conducted significant bicycle and public health related outreach to traditionally underrepresented populations, i.e., groups who are not seen in the bicycling community at levels equal to their presence in the broader community. This includes some racial and ethnic groups, as well as women, older individuals, and some immigrant communities.

THE COMMUNITY ENGAGEMENT TEAM[4]

Working through this team, City staff focused on determining what the barriers are to bicycling for underrepresented groups. After hosting a series of focus groups, specific issues were identified, leading to actions including training bicycle class instructors in cultural competency, hosting bicycle education workshops for immigrants, and creating a PSA campaign designed to invite all members of the Cambridge community to bicycle.

THE MEN'S HEALTH LEAGUE (MHL)

MHL is an initiative of the Cambridge Public Health Department focusing on outreach to traditionally underserved populations by working to better the public health of low-income men of color. MHL runs several events, including a series of outdoor bike rides for this group, and supported the event planning and outreach for the LIFT Earn-a-Bike Project, which provides refurbished bicycles to homeless and low-income residents.

HEALTHY AGING

The City of Cambridge, as a member of Cambridge in Motion, hosted a series of focus groups engaging with over 250 people over age 50 to talk about barriers to bicycling in our community.[5] The outreach included focus groups and "street team" tabling all over the city. It also included a series of bicycle education workshops, with free bicycle tune-ups. Ideas articulated through these conversations mirror those that were captured through the public process of the Bicycle Network Plan.

BICYCLE EDUCATION WORKSHOPS

Cambridge engages hundreds of residents in free bicycle education classes throughout the year. Workshops include "urban cycling basics," "women-powered cycling," bike maintenance basics, and on-bike refresher training. Recently, a new course was created to teach people how to use Hubway. Cambridge collaborates with MassBike (Massachusetts Bicycle Coalition)[6] to create new materials, updated curricula, new workshops (such as Beyond Bicycle Maintenance Basics), and instructor professional development, such as the cultural competency training mentioned above.

ENCOURAGING WOMEN TO BIKE

Women have been represented in the Cambridge bicycling community at higher levels than average in the US; currently more than half of the Bicycle Committee are women. In 2012, Cambridge focused specifically on women who bike and held events throughout July: the Cambridge Health Alliance hosted a nurse's ride, and the Green Streets Initiative[7] and the City hosted a Walk/Ride Day Celebration. Cambridge also holds the above-mentioned "women-powered cycling" workshops.

CITYSMART

Figure 6.3: Metro Pedal Power delivery bicycles used for CitySmart.

CitySmart is a community-based outreach program for promoting sustainable transportation across Cambridge. It started as a 3-year pilot program aimed at changing the mode-split on a neighborhood basis from single-occupancy vehicle to sustainable travel. Each year, a different neighborhood was selected for outreach. CitySmart used direct mail, outreach events, posters, and electronic media to reach participants. Materials were delivered directly to households using a bicycle delivery service, Metro Pedal Power. These efforts were supported by a series of walks, rides, and tours.

During the 3-year pilot, more than 2,200 households and more than 4,000 residents were reached. 36% of respondents from the first year stated that they had made some trip change as a result of the program and 88% have stuck with that change over the past three years. In a follow-up survey of Year 1 residents who said that they made a change in their travel habits 53% stated they were walking more often, 59% were bicycling more often, and 40% were using transit more often. According to follow-up surveys, the program significantly increased awareness of sustainable transportation options, and received positive feedback and support for program expansion.

The program has now been rolled out on a citywide basis and will continue to educate Cambridge residents about commuting options and to gather data about travel habits. More information can be found at: www.cambridgema.gov/citysmart

Figure 6.4: Examples of educational materials available at **www.cambridgema.gov/bike**

OUTREACH AND EDUCATION FOR CHILDREN IN CAMBRIDGE PUBLIC SCHOOLS

As noted in Chapter 1, the Cambridge School Wellness Policy supports and promotes active transportation for the health and well-being of its students and staff.

LEARNING TO RIDE

The Cambridge Public Schools' Physical Education Department, in conjunction with the Cambridge Police and Cycle Kids (a Cambridge-based non-profit educational organization that teaches children bike riding skills, safety, mechanics and health), teaches bicycle skill as part of the physical education curriculum for 4th grade students.

SAFE ROUTES TO SCHOOL

In spring 2015, Cambridge launched a formal Safe Routes to School[8] program to support and encourage safe walking and biking to school. This program is federally funded, administered by MassDOT, and implemented locally by municipalities.

As a first step, parents were surveyed to learn more about student's travel patterns and identify barriers to walking and biking to school. Surveys were completed for approximately 1,000 students.

Subsequently, Vassal Lane Upper School and Tobin Montessori School signed up for pilot encouragement and outreach programs with twice-a-year walk/bike to school day celebrations, frequent walker/biker punch cards to earn raffle prizes, and in-school pedestrian and bicycle training. For the 2015-2016 school year the Safe Routes to Schools Program will expand to the Graham and Parks Elementary School, the Peabody School, and the Rindge Avenue Upper School. It is expected that additional schools will also join for this year.

Cambridge Rindge and Latin School is currently coordinating with the Community Development Department on Safe Routes to School programming; the new programs began in the summer of 2015. They include on-bike training and helmet giveaways for incoming freshmen as well as ongoing outreach and promotion of safe bicycling to sophomores, juniors and seniors.

In addition, the Community Development Department holds school district-wide events to promote Safe Routes to School, including Massachusetts Walk and Bike to School Day and a number of kid-focused activities at Fresh Pond Day such as a bike rodeo, bicycle decorating, a kid's bike parade, and bike tune ups.

OTHER ON-BIKE TRAINING FOR CHILDREN

On-bike training events particularly aimed at children are also occasionally conducted in conjunction with other events and programs, such as during the Cambridge Science Festival or part of CitySmart programming. These will continue as appropriate opportunities arise.

ENFORCEMENT

Law enforcement promotes bicycle safety. It decreases both intentional and unintentional infractions. Community education and support of enforcement together build respect between bicyclists and motorists. Enforcement is primarily seen as an educational tool applied to all road users to emphasize the importance of safe travel. Throughout the month of May, the Community Development Department and the Cambridge Police Department partner to host over a dozen educational efforts designed to engage with people in cars and people on bike around the rules of the road. This successful program grows year to year.

ENFORCING BICYCLIST INFRACTIONS

Cambridge police are trained on bicycle laws and enforcement during their annual in-service training. The Cambridge Traffic unit has had specific responsibilities for enforcement against bicycle offenders. Enforcement generally targets the busiest commercial districts, where conflicts among all right-of-way users are greatest. Citations that carry $20 fines may be issued at the officer's discretion; the amount of the fine is set in state statute.

ENFORCING MOTORIST INFRACTIONS

Cambridge police are trained regarding laws that protect people who ride bicycles in Cambridge. Massachusetts General Law requires motorists to yield to straight-moving bicyclists before turning right or left, and makes it illegal to drive in the bike lane except in order to turn at an intersection. Drivers who "door" bicyclists are subject to fines set forth by state statute. For relevant statutes, see Massachusetts General Law Ch. 85, Section 11B and Ch. 90, Section 14.[9]

Another facet of enforcement is ensuring that bicycle facilities are safe and accessible for bicyclists. Double parking – i.e., blocking a lane – is illegal anywhere but there is a particular fine when this occurs in a bicycle lane ($35).

ENCOURAGING CITY OF CAMBRIDGE EMPLOYEES TO BIKE

Cambridge's commitment to bicycling includes providing bikes for City employee use, offering bicycling classes geared toward City staff, and offer related benefits, such as free Hubway membership.

ENGAGEMENT OF CITY STAFF

BIKE EDUCATION WORKSHOPS

The City of Cambridge offers the free bicycle education workshops outlined above to City employees. City employees are invited to attend any and all community workshops; in addition, specially scheduled workshops take place during work hours and are offered as official professional development trainings for City employees.

TRANSPORTATION WORKSHOPS

The City hosts departmental trainings for City staff on the transportation benefits offered to City employees. These workshops focus on all sustainable modes of transportation, and also teach City employees the rules of the road when on bike, on foot, or in a car. These are currently mandatory for Traffic, Parking & Transportation, Department of Public Works, Library, and many individual school employees.

BICYCLE TUNE-UPS

The City offers free bicycle tune-ups for City employees every spring and summer. Dozens of City staff take advantage of these workshops each year.

HUBWAY MEMBERSHIP

The City offers its employees free or discounted Hubway membership. A priority of the expansion of the Hubway system is to put in new stations near municipal buildings (including schools) to ensure that all City staff can travel to meetings and to/from work or a transit station by Hubway bicycle if they desire.

CITY BICYCLES

Several City departments use bicycles as fleet vehicles.

+ **Police.** The Police Department's Community Relations unit patrols by bike. It has led bicycle education programs in the Cambridge schools and at special events, engaged in targeted enforcement activities with people in Cambridge, and worked on preventing bicycle theft.
+ **Traffic, Parking and Transportation**. A number of parking control officers within this department patrol by bicycle.
+ **CityBikes**. Bicycles are available to staff at municipal buildings for work-related trips. They are located at the City Hall Annex, the Lombardi Building, Public Works, City Hall, the Main Public Library, and the Water Department at Fresh Pond Reservation.
+ **DPW Operations**. Bicycles are used for some recycling pickup and for street tree watering.

REGULATIONS THAT SUPPORT BICYCLING

CAMBRIDGE ZONING ORDINANCE

The policies imbued in the Cambridge Zoning Ordinance are focused on creating a sustainable, human-scale environment. In particular, Article 19 of the Zoning Ordinance has specific requirements intended to ensure that new developments create a pedestrian and bicycle-friendly environment. The ordinance also has detailed requirements related to bicycle parking; these are discussed in Chapter 7.

ARTICLE 19

Article 19 of the Cambridge Zoning Ordinance is a special permit process for large projects that requires a rigorous analysis of transportation impacts, including bicycle and pedestrian circulation. Its goal is to "encourage applicants to adopt a development program that reduces the number of single occupancy vehicles coming to the site. Such a program would encourage pedestrian and bicycle access to the site and throughout the neighboring district and reduce potential negative impacts on abutting properties of the vehicles coming to the site." The ordinance enables the Planning Board to assign mitigation for traffic impacts, including bicycle facilities improvements.

Part of the requirements are for new development projects to undertake a Traffic Impact Study, including bicycle counts, an evaluation of the access and connectivity that bicyclists have to the development site, and an analysis of the impacts of new traffic generated by the development on bicyclists and bicycle safety. Developers are often required to undertake mitigation measures such as adding bicycle facilities on roads adjacent to the project.

PARKING AND TRANSPORTATION DEMAND MANAGEMENT ORDINANCE

The PTDM Ordinance requires non-residential properties to implement strategies to ensure that people traveling to those sites use primarily sustainable transportation and limits the percentages that are allowed to travel by single-occupancy vehicle (SOV).

Example measures include subsidized transit passes, charging market rates for car parking, showers and locker rooms, financial incentives for people walking or bicycling, bicycle fixit stations, and flexible parking arrangements for people who usually arrive by sustainable mode but occasionally need to drive a car.

The PTDM Ordinance is a national model for improving mobility and access, reducing congestion and air pollution, and increasing safety by promoting walking, bicycling, and public transit. PTDM projects require annual monitoring; those not in compliance with their SOV mode-split requirement are mandated to add additional measures. Monitoring also shows voluntary benefits that many companies provide because the city's employment culture has come to expect them, such as on-site bike repair service, loaner bikes, and bike-buddy matching.

After its first 10 years, the Ordinance limited growth in automobile trips, with more than 38 million fewer vehicle miles traveled - 24% less than if the requirement wasn't in place.

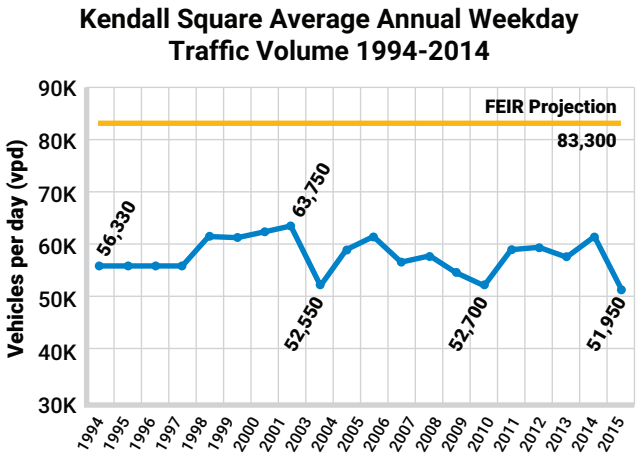


Figure 6.5: Average weekday traffic volumes for Kendall Square measured between 1994 - 2014. Data suggests that motor vehicle traffic remains significantly below FEIR projections.

Figure 6.6: The Cambridge Bicycle Committee organizes regular community rides through Cambridge.

The PTDM Ordinance has been extraordinarily successful, as epitomized by the results in Kendall Square. In the Kendall Square area alone, over 4.6 million square feet of development has occurred over the past decade, without increasing traffic on area streets. Much of this new development is high tech/R&D, where attracting high level employees is competitive and those workers expect and value the ability to bike to work.[10]

PUBLIC AND INTERDEPARTMENTAL COORDINATION

CAMBRIDGE BICYCLE COMMITTEE

In 1991, the Cambridge Bicycle Committee was officially created as a permanent advisory committee appointed by the City Manager. It comprises people who live or work in Cambridge, representatives from Harvard and MIT, and staff from related departments: Community Development; Traffic, Parking, and Transportation; Public Works; and the Police.

The purpose of the Committee is to work to improve conditions for bicycling in Cambridge, to promote bicycling as transportation, and to improve safety for bicyclists. The Committee reviews projects, provides advice and assistance to City departments, and advocates for improvements. Committee members also undertake projects on their own or in conjunction with City staff.

The Committee organizes free community rides twice a year, in May and September. The May rides, held as part of Bike Week/Bike Month celebrations, have themes that highlight and celebrate the riches of Cambridge. These have included overview of public art, history tours, famous people, architecture, and more. Police Department staff accompany the rides, which are specifically geared to riders of all ages and abilities, and enable people who may not feel comfortable traveling on city streets to do so. The rides, which typically draw 200 - 250 people, are created and led by members of the Committee, and supported by community businesses.

Information on all Cambridge Bike Committee rides can be found at: www.cambridgebikes.org

COORDINATION AMONG CITY DEPARTMENTS AND WITH OTHER AGENCIES

Many bicycle-related issues and projects have overlapping jurisdictions within City departments. To coordinate the planning and implementation of transportation projects, Cambridge staff who deal with transportation issues meet monthly.

There are several standing interdepartmental committees who work together on projects and programs to support and encourage bicycling:

+ **Transportation Committee (DPW, TP&T, CDD, Water Dept., Disabilities Commission)**: Coordinates all City projects with transportation implications; ensures that all opportunities to improve bicycle (and pedestrian) conditions are incorporated; reviews projects; coordinates funding.

+ **Design Working Group (DPW, TP&T, CDD:** Reviews and coordinates the design of projects, including traffic calming projects; incorporates bicycle facilities, design challenges.

+ **Healthy Children's Task Force (Health; Schools, TP&T, CDD, Community Groups:** Promotes the health of children in Cambridge through identification of priority topics and resources and development of strategies for addressing issues. Supports youth physical activity, including walking and bicycling to school. The 5-2-1 Committee focuses particularly on promoting physical activity.

+ **Food and Fitness Policy Council (Health, CDD, Schools, Human Services, Community Organizations, Universities)**: Promotes health through improving access for all residents to healthy foods and to physical activity.

+ **Crash Analysis Working Group (Police, TP&T, CDD, DPW)**: Reviews crash data to identify patterns and locations for targeted enforcement and/or engineering improvements.

OTHER AGENCIES AND INITIATIVES

Coordination and advocacy with other state agencies is important as well, including:

+ The **Massachusetts Department of Transportation (MassDOT)**, the **Massachusetts Bay Transportation Authority (MBTA)**, and the **Massachusetts Department of Conservation and Recreation (DCR)**.

+ The **Cambridge Public Health Department** has a central role in encouraging bicycling as part of promoting active lifestyles and obesity prevention in policies, outreach efforts, and promotional activities and many of their activities are done in partnership with other departments.

+ **Let's Move** is a national campaign, spearheaded by First Lady Michelle Obama, to solve the problem of childhood obesity. In February 2011, Cambridge officially signed on to be a Let's Move city. Local Let's Move partners have been active in promoting a healthy lifestyle for children and families for many years. Cambridge's Let's Move profile page on the National League of Cities website highlights its accomplishments: http://www.healthycommunitieshealthyfuture.org/places/#Cambridge,MA

+ **Cambridge in Motion** aims to create an environment that makes it easier for residents and people who work in the city to be physically active. Funded by a federal Community Transformation Grant.

+ **Cambridge Office for Tourism** provides information on getting around Cambridge by bike for visitors.

WORKING WITH COMMUNITY PARTNERS

Local organizations and institutions are important partners in supporting bicycling in Cambridge. This section describes some of these partners, but is by no means an exhaustive list.

EDUCATIONAL INSTITUTIONS

HARVARD UNIVERSITY

Distributes outreach materials to incoming students; promotes bicycling extensively through the Commuter Choice Office; donated seven Hubway stations in Cambridge; helps to develop ideas for improving bicycle infrastructure; expands bicycle parking to the public realm.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Promotes bicycling through its transportation services and planning offices; provides four Hubway stations; constructed the country's first true cycle track on Vassar Street (2004-2009); hosts the MIT Media Lab, with a division specifically focused on sustainable transportation and innovative design.

LESLEY UNIVERSITY

Promotes bicycling as transportation; has an internal bike share system; adding a Hubway station to its new building in 2015.

EF EDUCATION FIRST

Donated a large Hubway station; constructed expanded off-road paths in the North Point area; supports and helps to promote the expansion of the path system.

Figure 6.7: EF Hubway Station

Figure 6.8: Harvard Square Hubway Station

PRIVATE SECTOR

TRANSPORTATION MANAGEMENT ASSOCIATIONS

Charles River TMA (CRTMA). Helps local businesses develop convenient programs, improve mobility and promote accessibility to the Kendall Square and East Cambridge area. Promotes bicycling with information and support.

Alewife TMA. A partnership between businesses, developers, and residential buildings who join together to reduce traffic congestion and air pollution and improve transportation options in the Alewife area.

Run & Ride
@CambridgeSide
Hey kids!
Save the Date!
Do you love to ride your bike and run?
Compete in the sixth annual, kids only
FREE duathlon with biking and running
in and around CambridgeSide!
For kids ages 5-13 years old, with
prizes, race T-shirts, giveaways, entertainment
and more. Registration opens in June.
iPad awarded for each race winner!*
Sunday, July 26, 2015
8:30am Registration • 10am Event Begins
CambridgeSide - Canal Park
100 CambridgeSide Place, Cambridge, MA
FREE family fun!
GALLERIA
CambridgeSide
www.shopcambridgeside.com
*iPad awarded to first place winner for both boy and girl category in each age bracket. Eight will be awarded.

Figure 6.9: CambridgeSide Galleria Event Poster

CHAMBER OF COMMERCE, BUSINESS ASSOCIATIONS AND CAMBRIDGE LOCAL FIRST

These work to support vibrant livable cities and recognize that Cambridge is a city where people who bicycle and walk are likely to support local businesses. For references, the Economic Development division of CDD provides information: http://www.cambridgema.gov/CDD/econdev/districtinfo

LOCAL BICYCLE SHOPS/ENTERPRISES

There are nine bicycle shops located in Cambridge (as of 2015), and several other enterprises such as Bikeabout, a bicycle tourism company; Cambridge Pedi-Cab; and Superpedestrian, developers of the Copenhagen Wheel. Urban Adventours is based in Boston but supports Cambridge events and activities.

INDIVIDUAL BUSINESSES/COMPANIES AND HUBWAY CHAMPIONS

Many companies choose to locate in Cambridge specifically for its livability and the desire of their employees for a community that supports active lifestyles. Several companies have voluntarily donated Hubway stations to support their employees (Biogen, BioMed Realty, CambridgeSide Galleria, Google).

The CambridgeSide Galleria partners with the City on the annual Run & Ride event to promote active health and fitness for children.

ADVOCACY ORGANIZATIONS

MASSBIKE

The statewide bicycle advocacy organization; partners with the City to lead bicycle workshops; advocates on a state-wide level for legislation to support bicycling.

LIVABLE STREETS ALLIANCE

Advocacy organization to promote livable communities that rely on sustainable transportation. Partners with the City on outreach and on events, such as the "Rush Hour Race" during Bike Month.

BOSTON CYCLISTS UNION

Advocacy organization to promote bicycling as a normal way to get around for people of all walks of life. Some work is also done in neighboring communities, including Cambridge. Works with the City on outreach and citizen engagement.

CYCLEKIDS

Dedicated to teaching children to ride, the CYCLE Kids program teaches children in the 5th and 6th grades in Cambridge Public Schools through the physical education classes.

GREEN STREETS INITIATIVE

A Cambridge-based organization "Dedicated to celebrating and promoting the use of sustainable and active transportation;" its primary outreach is through monthly Walk/Ride Days, which are held in partnership with the City.

BICYCLE BENEFITS

Promotes the partnership of bicycling and businesses; a Bicycle Benefits sticker will provide discounts to member businesses. Free stickers for Hubway members.

ENDNOTES

1 The Governor's Highway Safety Bureau in Massachusetts is responsible for changes to the driver's education manual and tests.

2 Walk/Ride Days focus on encouraging people to choose a more sustainable transportation mode once a month. See http://gogreenstreets.org/walkride-days

3 The City series of focus groups, led by the Food and Fitness Policy Council and staffed by the Community Engagement Team, resulting in the PSA campaign to invite residents of Cambridge to "Come join your community – bike in Cambridge." This slogan was printed in five languages (Portuguese, Spanish, Mandarin, Nepali and English), and showed women, people of color, immigrant families, and police officers riding their bicycles through Cambridge.

4 The Community Engagement Team ia a multi-agency collaboration housed in the Department of Human Services that reaches out to underserved Cambridge families and connects them to community events and resources, develops community leaders, and supports agencies in working with a diverse community. The Community Engagement Team hires and trains community members (American Born Black, Bangladeshi, Brazilian, Ethiopian, Haitian, Somalian and Spanish and Portuguese speaking) as outreach workers to reach out to and engage underserved families in their native communities. http://www2.cambridgema.gov/dhsp2/cet.cfm.

5 This engagement, funded by the Massachusetts Councils on Aging, was a partnership between the Fresh Pond Apartments (low-income housing), the Agassiz Baldwin Community Center, the Council on Aging, MassBike, the Volunteer Health Advisors, the Community Development Department, and the Cambridge Public Health Department.

6 For more information, visit http://massbike.org

7 For more information, visit http://gogreenstreets.org

8 For more information, visit http://www.saferoutesinfo.org/

9 For more information, see Massachusetts General Law Ch. 85, Section 11B: https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIV/Chapter85/Section11b; and Ch. 90, Section 14: https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIV/Chapter90/Section14

10 For more information about the program, visit http://www.cambridgema.gov/ptdm

CHAPTER 7

BICYCLE PARKING AND PUBLIC BICYCLE REPAIR FACILITIES

OVERVIEW

Bicycle parking facilities are a fundamental element of bicycle transportation infrastructure. Providing bicycle parking also encourages people to use their bicycles as transportation; people are more likely to use a bicycle if they are confident that they will find convenient and secure parking at their destination.

Providing a designated area for bicycle parking gives a more orderly appearance to a building and prevents people from locking their bicycles to unacceptable fixtures, such as trees, benches, or railings. However, if a bicycle rack appears insecure, does not fit bicycles well, or is in the wrong location, people will not use it.

Another feature that supports bicycling are public repair stands, which provide tools for basic maintenance. Since many people do not carry tools with them, an unexpected malfunction could leave them stranded. When people have the ability to make on-the-spot fixes or fill up a flat tire, it instills confidence that they will be able to continue to ride even when something unexpected happens.

PUBLIC BICYCLE PARKING

RACKS

Cambridge has established standards for bicycle racks for city sidewalks and other public property (parks, schools, etc.). These standards are based on ease of use, size, flexibility of placement, design quality, and cost. The most common model is the "post and ring," but the "swerve" and "u-rack" models are also used, as are more whimsical and artistic designs that meet the standards (see Figure 7.1 - Figure 7.4 for examples of rack types). Most racks are set individually, but occasionally "rail" systems are used where more permanent installations are not feasible.

Figure 7.1: "Post and ring" style bicycle parking provided in front of EF Education First Building adjacent to North Point Park.

Figure 7.2: The "Swerve" rack on a rail system enables racks to be located where it is not feasible to drill into pavement.

Through the bicycle parking program, public bicycle parking for approximately 3,000 bicycles have been installed throughout the city to date, including at every public building, with high concentrations in business districts.[1] Individuals or businesses can also request a bicycle rack installation on public property by visiting the Bicycle Parking Program webpage.[2]

ON-STREET BICYCLE CORRALS

Because of limited sidewalk space available for bicycle parking, especially in dense business districts, combined with competing sidewalk uses such as accommodating increased pedestrian travel and sidewalk cafés, Cambridge has a program to seasonally utilize on-street parking spaces for bicycle parking stalls. Each stall fits in one vehicle parking spot and provides parking for 10-14 bicycles. Stalls are put into storage for the winter months to allow for unhampered snow plowing operations.

REGULATIONS

The City has regulations regarding where people can park their bicycles on the public way. For these purposes, the public way primarily means city sidewalks, but also includes public plazas and parks. The principal intent of these regulations is tri-fold:

1. **Provide short-term parking for bicyclists in commercial districts**
2. **Ensure that bicycles are parked in a safe and secure manner**
3. **Reserve bicycle racks for bicyclists only and not for motorized vehicles such as scooters and motorcycles.**

Figure 7.3: Curb extensions are sometimes built in order to provide space for added bicycle parking, and the "post and ring" model has a compact footprint.

One of the important ways of meeting these intentions is to remove abandoned bicycles that are taking up valuable spaces that could be used by other bicyclists. A 72-hour maximum time frame for bicycle parking was instituted for bicycle spaces in designated commercial and retail districts, as these are not intended for long-term storage. This is to ensure that those coming to the districts by bicycle are able to find parking quickly and easily.

The regulations also address the fact that parking a bicycle to some fixtures is not acceptable: trees can be damaged, benches rendered unusable, or hand railings be unavailable to those who need them for accessibility reasons. Bicycles may not be attached to handicap placard sign posts. Finally, the regulations prohibit motorized vehicles from using the bicycle racks.

For complete regulations, please visit the Parking Your Bicycle webpage.[3]

Members of the public can report abandoned bicycles or broken bicycle parking racks using the iReport app.

CAMBRIDGE iReport

cambridgema.gov/iReport

PRIVATE BICYCLE PARKING

ZONING REGULATIONS FOR BICYCLE PARKING

The City of Cambridge, through its Zoning Ordinance, has required bicycle parking as part of new development since 1981. The early adoption of bicycle parking benefitted Cambridge's ability to support increased bicycling over time. These requirements, along with other improvements and investments made by the City, have helped to support bicycling as a preferred transportation option in Cambridge. With the dramatic increase in bicycling in Cambridge over the past decade, demand for bicycle parking has grown significantly.

In June 2013, the requirements for bicycle parking in new development underwent a major revision. The zoning changes clarify the appropriate standards for bicycle parking design, layout and location, and require quantities of bicycle parking that better meet today's demand as well as the City's future goals for bicycling.

By requiring appropriate types and quantities of bicycle parking, the City is able to more effectively, systematically and efficiently manage the needs of the bicycling population, as well as to support the goal of increasing and promoting sustainable transportation use.

For more information about, please visit the Bicycle Parking Zoning webpage.[4]

Figure 7.2: Privately provided bicycle parking at One Kendall Square.

BICYCLE PARKING GUIDE

The **Cambridge Bicycle Parking Guide**[5], released in 2013 to complement the revised zoning regulations, is a resource for developers to ensure compliance with zoning regulations. The guide showcases the City's preferences for types of bicycle racks, spacing between racks, and siting of racks. This is also helpful for property owners who are interested in upgrading existing bicycle parking facilities or supplying additional bicycle parking.

For new buildings and significant renovations, zoning requires that these standards be met, but they should be followed for any new bicycle parking, as they will provide the most useful and effective bicycle parking and will be accessible and visible to people of all ages and abilities.

Full details on bicycle parking layout and zoning requirements are available online and in Appendix E.

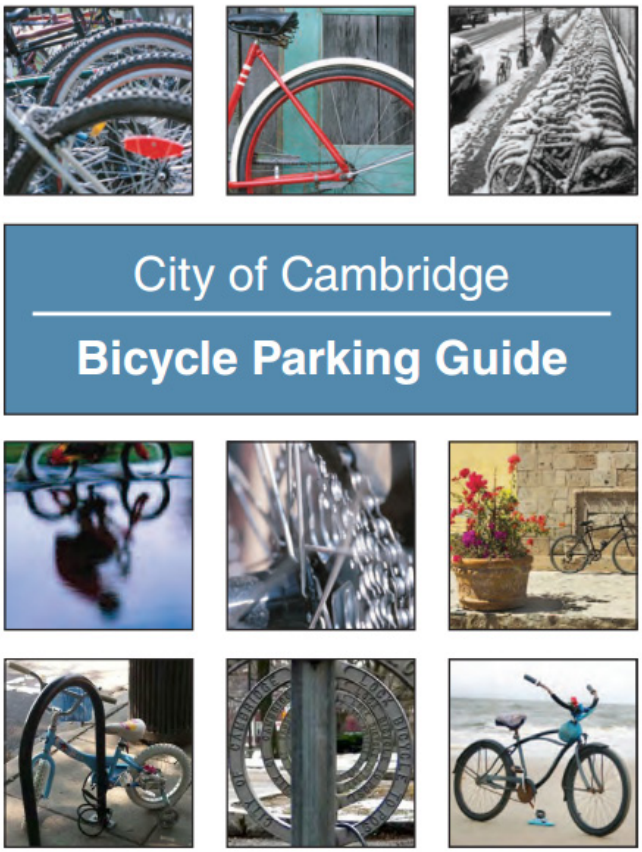


Figure 7.3: Weather-protected bicycle parking is desirable where bikes are parked for long periods

BICYCLE RACK DESIGN STANDARDS

There are a variety of designs for bicycle racks produced by many manufacturers. Bicycle racks can be purchased as single units, with a capacity of locking 2 bicycles (one on each side), or as multiple units attached together, with a larger capacity. However, not all manufactured bicycle racks meet Cambridge's standards.

Features of an acceptable bicycle rack:

- **Installed on a permanent foundation (e.g., concrete pad) to ensure stability.**
- **Securely anchored into or on the foundation with tamper-proof nuts if surface mounted.**
- **Support for an upright bicycle by its frame horizontally in two (2) or more places.**
- **Keeps both bicycle wheels on the ground.**
- **Design that prevents the bicycle from tipping over.**
- **Ability to support a variety of bicycle sizes and frame shapes.**
- **Space to secure the frame and one or both wheels to the rack with a cable, chain, or u-lock.**
- **Diameter of locking pole is no more than 1.5 inches.**
- **Galvanized or stainless steel racks are recommended (and required for racks on public property) because they hold up best.**

Acceptable racks, like the "Inverted U," "Swerve," and "Post and Ring" racks, have two-point support and fit a variety of bicycle types. Custom designs and "artistic" racks can also be used, provided they meet the performance criteria for bicycle racks.

Figure 7.4: Whimsical racks welcome students at Cambridge Schools.

PUBLIC BICYCLE REPAIR STANDS

To support people bicycling, the City has put out public bicycle repair stands to assist with minor things that are readily fixed, but that need the proper tools, such a tire that needs air, a loose chain, or a handlebar that needs adjustment.

There are four stands currently in the city (Fresh Pond Reservation, Harvard Square, Cambridge Main Library, and Kendall Square) but through the City's Participatory Budgeting Process, eight (8) additional stands will be established throughout the city in 2015-2016. In addition, the universities in the city and several private entities have these facilities available.

For more information, please visit the **Bikes in Cambridge** webpage.[6]

Figure 7.5: Example of a public repair stand and on-street bike corral located in Kendall Square.

ENDNOTES

1 [on-line map in the works, provide link here – hold space for nos]

2 "Bicycle Parking Program." Cambridge Community Development Department, http://www.cambridgema.gov/CDD/Transportation/projects/bikeparking.

3 "Parking Your Bicycle." Cambridge Community Development Department, http://www.cambridgema.gov/CDD/Transportation/gettingaroundcambridge/bybike/Parking.aspx

4 "Bicycle Parking Zoning Modifications." Cambridge Community Development Department, http://www.cambridgema.gov/CDD/Projects/Planning/bicycleparkingzoning

5 "Cambridge Bicycle Parking Guide." Cambridge Community Development Department, http://www.cambridgema.gov/~/media/Files/CDD/Transportation/Bike/Bicycle_Parking_Guide_20130926.ashx

6 "Bikes in Cambridge." Cambridge Community Development Department, http://www.cambridgema.gov/CDD/Transportation/bikesincambridge.aspx

CHAPTER 8

PUBLIC TRANSPORTATION AND PUBLIC BIKE SHARE

MULTI-MODAL TRIPS: PUBLIC TRANSPORTATION

Most transit trips begin and/or end with a walk or bike ride. A combination of bicycling and transit makes both modes more useful. Linking bicycles with mass transit — both bus and rail — overcomes barriers such as long distances or poor weather conditions. Transit can also be a supportive alternative when conditions cause a person to be less willing or able to bike, for example when an unexpected weather event or change in plans makes a bicycling trip more of a challenge.

During the past decade, there has been significant growth in bicycle and transit integration. Transit agencies are increasingly adding bicycle racks on buses, allowing bicycles to be brought on board trains, installing bicycle racks and lockers at transit stations, providing staffed bicycle parking facilities (also referred to as bike stations) at major transit hubs, and offering other bicycle services.[1] Bike share programs - where bicycles are made available for shared use to individuals on a short term basis (see the "Public Bike Share" section later in this chapter - generally ensure that bike share stations are well located to complete the bike-transit connection.

There are many reasons for the growth in bicycle and transit integration. Transit agencies have found that bicycle services can provide the following benefits:

+ **Bicycling extends the catchment area for transit services and provides greater mobility to customers at the beginning and end of their transit trips—a solution to the so-called "last mile problem."**

+ **Bicycle-on-transit services provide bicyclists with the option to take transit to avoid riding after dark, up hills, in poor weather, or in areas that do not provide comfortable bicycle access.**

+ **Bicycle-on-transit is an option for bicyclists who experience mechanical problems or need to get home in an emergency.**

+ **Bicycle and transit integration helps with the goals of decreasing automobile traffic and associated negative impacts of air pollution and congestion by expanding the range and options for people to travel by means other than the car.**

All of these benefits help communities support sustainable travel and make transportation systems work more efficiently.

BICYCLES ON TRANSIT

Cambridge and the Boston area are served by the Massachusetts Bay Transportation Authority (MBTA) which operates four rapid transit rail lines and many bus routes throughout the region. Cambridge works collaboratively with the MBTA to provide better bicycle accommodations at stations and on transit vehicles. In addition, Cambridge works on its own to improve bicycle and transit integration in other ways, such as by providing additional bike parking near transit stations.

Figure 8.1: Bikes loaded onto MBTA buses.[2]

The MBTA has made significant improvements for bicycle access in recent years, both at transit stations and on transit vehicles. All non-electric[3] MBTA buses now have racks to carry bicycles on the front of the bus. The current MBTA program, "Bikes on the T," allows passengers to bring their bicycles on the Red, Orange, and Blue Lines, as well as on the Commuter Rail. However, access is limited at certain hours, stations, lines, and times. Folding bikes are allowed on all vehicles at all times when folded. The Newburyport/Rockport and Cape Flyer Commuter Rail lines run special high-capacity bike cars at certain times during the summer.

For current rules and regulations, as well as updates to the system, visit the MBTA's Bikes on the T[4] webpage.

PARKING AT TRANSIT STATIONS

In Cambridge, outdoor bicycle parking is available at all MBTA subway stations and covered parking is available by the Central Square Red Line station. Bike parking is also available at the First Street Garage near the Lechmere Green Line Station.

The MBTA has been expanding bicycle parking at major transit stations with Pedal & Park bike parking cages. Currently, these facilities exist at 14 stations and fit between 50 and 150 bikes each. There are three at the Alewife MBTA station, each accommodating up to 150 bikes.[5]

There is no charge to users for the parking. The cages are covered and enclosed with security fencing. Security cameras and controlled-access doors greatly enhance bicycle safety and security. To access the bike cages, bicyclists need to obtain and register[6] a free plastic Charlie Card or Bike Charlie Card (Figure 8.2).

Figure 8.2: Bike CharlieCards allow users to access Pedal & Park stations.

Figure 8.3: Pedal & Park at Alewife MBTA Station (photo: David Loutzenheiser)

In conjunction with the planned expansion of the Green Line to Somerville and Medford, Lechmere Station will be moved and a new station will be constructed, including a bicycle parking cage expected for completion in 2017.

IMPROVING BIKE ACCESS ON TRANSIT

Other enhancements to public transportation can help make the system friendlier to bicycles. As trains and buses are replaced or the system is expanded, additional improvements can be made, such as integrated bike racks in rail cars and buses or expansion of hours when bikes are allowed on board. Improvements that make it easier to carry bikes onto buses and trains can also support increased bicycling as well as support accessibility goals more generally.

These improvements include low-floor buses, elevator access, and stair channels for wheeling bikes up staircases. A stair channel (Figure 8.4) is a smooth channel(s) along the edge of a stairway that is used to roll a bicycle up and down the stairs. Since bicycles are not allowed on the escalators and elevators are often not conveniently located, stair channels are an enhancement that makes taking bikes up and down stairs more manageable.[7]

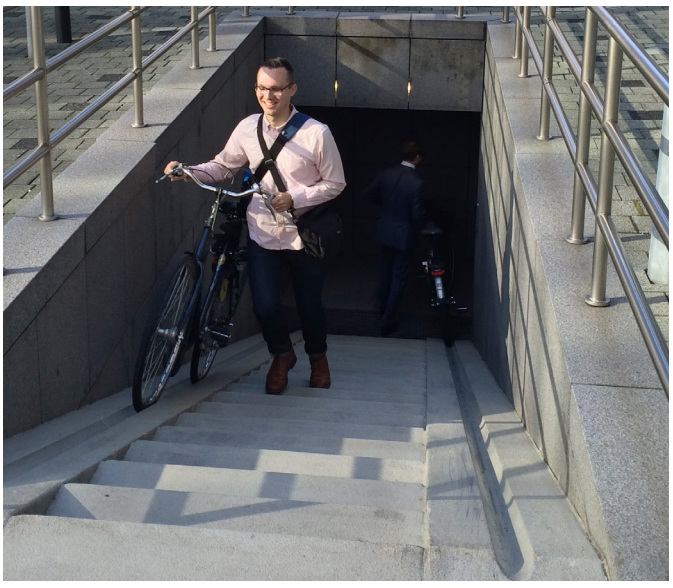


Figure 8.4: Stair channels allow people to easily roll their bicycles up and down stairs.

PUBLIC BIKE SHARE

Bike share is a public transportation system using bikes. Users are able to pick up a bicycle at any self-serve bike-station and return it to any other station located within the system's service area. Bike share is ideal for short distance point-to-point trips. Bike share programs are well positioned to connect people up with a bus or rail system, accommodating the last mile or so between home or work and transit.

The availability of bike share has encouraged more people to ride, as it eliminates some of the barriers that might otherwise exist for people to try out a bike. Bike share:

+ **Makes** bikes available to those who don't own a bike
+ **Eliminates** worry about bicycle theft and the hassles of bike maintenance and repair
+ **Takes** care of details such as bike lights and baskets
+ **Provides** bikes for those who don't have bike storage at their home or office
+ **Enables** people who travel in from further out to use a bike in town
+ **Offers** an inexpensive option, with minimal capital investment

Bike share also provides visitors with a great way to travel around the city easily.

The value of these systems is self-evident: they have proven to be wildly popular. By the end of 2014, 855 cities across the globe had bike share systems. That's compared to 703 one year earlier in 2013, and only 11 cities a decade earlier in 2004.

HUBWAY

Hubway is Cambridge's regional bike share system. The participating municipalities are Cambridge, Boston, Brookline, and Somerville. Through the public procurement process, managed by the Metropolitan Area Planning Council (MAPC), additional municipalities in the greater Boston region may also join. The system is fully integrated amongst the participating municipalities, providing a seamless experience for users taking the bikes across municipal boundaries.

In 2011, Hubway was launched in Boston, followed by Cambridge, Brookline and Somerville in 2012. The system is owned by the municipalities, who contract with a vendor to operate and manage the program. There is reciprocity across the system, meaning that a user can retrieve a bike in Cambridge and return it to a station in Boston, Brookline, or Somerville, or vise versa.

The growth of the Hubway system, both in size and ridership, has been dramatic since its launch, with continually increasing use on every measure. The Hubway system is being expanded on an ongoing basis; in 2015-16, Cambridge plans to add another 15 stations to the 33 existing ones in the city.

Funding for Hubway is provided through a combination of federal and state grants, municipal funds, and private sponsorships and donations. In Cambridge, as of 2015, several major partners have funded stations, including Harvard University

Figure 8.5: CambridgeSide Galleria Mall Hubway. The Mall was one of the first private partners to support a Hubway station in Cambridge.

(7 stations), MIT (4 stations), CambridgeSide Galleria Mall, Google, Biogen, BioMed Realty, and EF Education First. For the full list of donors and partners, please visit Cambridge loves biking![8]

Starting in 2013, Cambridge operated its Hubway stations year-round; the first two winters saw almost 81,000 trips during the seasonal operations.

A user survey was conducted in January 2014 to get feedback from members. Key findings include:

- **45% of respondents take Hubway to/from work or school. 13% use it to access public transportation, 13% use it for errands or shopping, and 13% use it for social events or going to restaurants.**
- **An overwhelming majority – 62% of respondents – use Hubway because it is the fastest way to get to their destination. 15% said they use Hubway because it is fun and they enjoy being on a bike.**
- **61% of respondents said that, in a typical week, they replaced at least one motor vehicle trip with a Hubway trip. 29% replaced four or more motor vehicle trips with a Hubway trip.**

A forthcoming report on Hubway statistics and user surveys and will be available on the City of Cambridge's Bikes in Cambridge webpage.

Hubway by the numbers

- Busiest station in the system: MIT at Mass Ave/Amherst St - **68,660** total station visits in 2014. 6 of the top 10 busiest stations are located in Cambridge
- Busiest day ever (through 1/1/15): Wednesday, July 30, 2014 - **7,020** trips
- **12,673** annual members and **88,779** casual passes (24-hr & 72-hr) in 2014
- **2.7 million trips** made,[9] **1.9 million lbs** of CO2 offset, **2.7 million miles** traveled, and **168 million calories** burned between 2011 - 2014
- The system has over **140 stations** across all four participating municipalities

THE BENEFITS OF BIKE SHARE

ACTIVE TRANSPORTATION AND HEALTH

+ Nice Ride, Minneapolis – **7%** took a trip they would not otherwise have taken

+ Capital Bikeshare, DC – **16%** of reported taking trips they wouldn't otherwise make.[11]

REDUCING CAR USE

+ In Capital Bikeshare's 2011 Member Survey, more than **41%** of users reported reducing their number of car trips after joining.

+ A 2010 survey for Nice Ride indicated that 20% of bike share trips replaced car trips

+ A 2014 Hubway survey indicated that **8%** of users would have used a motor vehicle for their last trip had Hubway not been available and that two-thirds replace car trips with Hubway at least once/week.

ENCOURAGING BICYCLING[12]

+ A study of the BIXI system in Montreal, published in the *American Journal of Public Health* concluded that "The implementation of a public bike share program can lead to **greater likelihood of cycling** among persons living in areas where bicycles are made available."[13]

+ Bike shop owners in DC have seen an increase in bike sales in the two years since Capital Bikeshare began operating, and many new customers have said that they were inspired to **purchase their own bike** after using bike share.

Number of Cities Around the World with Bike Sharing Systems

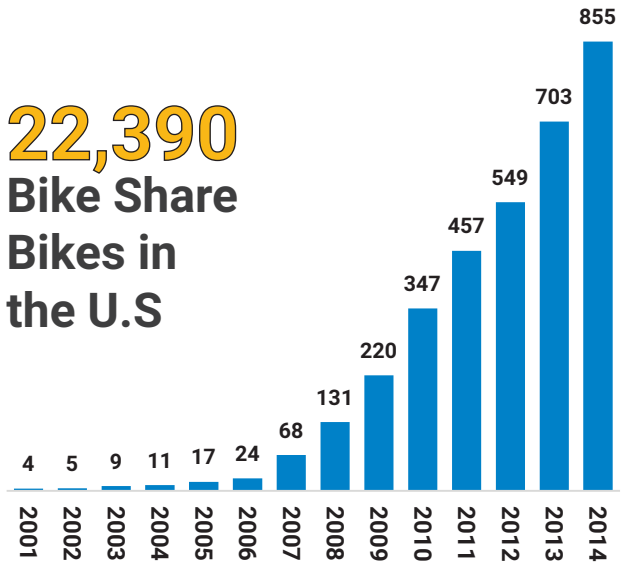


Figure 8.7: Table showing increase of bike-sharing around the world as of December 31, 2014.[10]

SAVING MONEY

+ Bicycling in general is an extremely inexpensive transportation choice, second only to walking. Bike share is very low cost, and is often **less expensive** than owning a bike, taking into consideration maintenance and wear and tear. A Hubway membership, for example, is only **$7/month**.[14]

+ Capital Bikeshare users reported saving an average of **$819 per year**. Most of these savings came from avoiding costs related to driving like gas, parking, and vehicle maintenance. Others reported saving money by replacing taxi trips with bike-share rides.[15]

SUPPORTING THE LOCAL ECONOMY[16]

+ Studies show that **local businesses benefit** from stations located nearby.

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CHAPTER 9

OPERATION AND MAINTENANCE

OPERATION & MAINTENANCE PROGRAM

Proper maintenance helps protect the investment of public funds in bicycle facilities – as well as all public infrastructure – and allow their safe use and enjoyment. Careful construction management allows people to continue to travel safely by bicycle when roadwork is being done or road access is otherwise disrupted.

The City of Cambridge has a monthly street cleaning program from April through December that includes bikeways. Travelway litter — such as broken glass, sand, gravel and wet leaves — is a hazard demanding regular pickup and sweeping. The April and November sweepings include the use of a vacuum sweeper in addition to mechanical sweepers in order to remove excess debris. These will also be included in the Department of Public Works (DPW) spring pothole patching program.

Roadway maintenance considers the needs of people who ride bicycles. Full width pavement overlays will be completed per the DPW's Five Year Street and Sidewalk program. DPW also maintains paved surfaces through the use of asphalt patches and crack sealing. Where utilities cuts occur, permanent patches will be made per DPW specifications. All new asphalt paving will be flush with utility covers. Traffic control during maintenance activities will include providing safe passage for bicyclists including clearly marked raised castings and signed detours when bikeways are obstructed.

Signs and pavement markings should be inspected regularly and kept in good condition. Every spring the Traffic, Parking, and Transportation Department prepares a pavement marking plan. Bicycle facility markings are included. Off-road facilities require specific plans. For example, the path along Fresh Pond Parkway/Fresh Pond Reservation is maintained by the Cambridge Water Department along with the path around the reservation.

DPW has a pothole hot line (617-349-4854) and a mobile app, iReport, to encourage the public to report locations that need patching. This information is included in bicycle information materials to encourage bicyclists to alert DPW to potholes in bikeways.

UNIQUE CHARACTERISTICS & NEEDS OF USERS

A roadway surface that appears to be adequate for automobiles may actually treacherous for people riding bicycles. Small rocks can deflect a bicycle wheel, a minor ridge in the pavement can cause a crash, or a pothole can cause a wheel rim to bend. Wet leaves are slippery and can cause a bicyclist to fall. Gravel and sand that are blown off the travel lane by automobile traffic accumulate near the edge of the road, where bicyclists usually ride.

Figure 9.1: LED signs placed around Cambridge remind road users to share the road during construction or after major snowfall events.

Figure 9.2: The Western Ave separated bike lane shown after a major snowfall event.

WINTER MAINTENANCE

Snow management poses particular challenges in a dense urban environment with limited space for snow storage. The City's first priorities are to ensure that emergency vehicles are able to get where they need to go. Toward that end, DPW will clear the streets as soon as possible after a storm event. The goals are to chemically treat all major arteries within three hours of when snow begins, to keep main arteries plowed during all stages of a storm, and to clear all streets and the sidewalks bordering City property once a storm has stopped.

An essential element of ensuring safe travel during and after snow events is proactively reminding the traveling public the importance of sharing the roadway. This is extremely important given that the roadways are typically narrowed during and after a snow event. DPW often deploys variable message boards around the City to highlight these messages.

Special bicycle facilities such as the separated bicycle lane on Western Avenue are addressed as soon as possible after the essential public ways, including key sidewalks, have been treated. Some of these facilities are maintained under separate agreements; Vassar Street, for example, is maintained by MIT (Massachusetts Institute of Technology), which clears the separated bicycle lane with the same vehicles they use on the adjoining sidewalks. As these facilities are contemplated in the future, snow operations will be a key consideration in the design details and long-term maintenance expectations.

CONSTRUCTION MANAGEMENT

GUIDELINES FOR BICYCLE ACCOMMODATION DURING CONSTRUCTION

APPLICABILITY

These guidelines shall apply to all construction projects in the City of Cambridge, whether the work is being undertaken by the City, private developers, contractors, utility companies or state agencies. The types of projects include:

- **Street reconstruction and new street construction**
- **Sewer, storm drainage and water projects**
- **Private site development, involving work within a City street (e.g., utility connections, temporary occupancy of parking or traffic lanes)**
- **Utility construction**

GENERAL

Bicycles are legal vehicles on all the streets of Cambridge. Through bicycle movement must be maintained during construction and other projects that disrupt travel (e.g., special events) subject to the approved construction management plan. People riding bicycles are particularly susceptible to disruptions in their normal travel routes because of their slower speeds and exposure to noise, dirt and fumes. Temporary lane restrictions, detours and other traffic control measures instituted during construction or other travel disruptions should be designed to accommodate non-motorized travelers.

For all construction projects, an approved Traffic Management Plan must meet these guidelines for bicycle accommodations.

PAVEMENT SURFACE QUALITY AND STRUCTURE

People riding bicycles, particularly those riding on narrow, high-pressure tires, need to have pavement as free of defects and debris as possible to ensure control of their bicycles. As most road bikes do not have a suspension system, high-pressure tires transmit every bump to the rider. Loss of control on deteriorated pavement with loose aggregates, potholes, litter, etc., is also a major risk.

Pavement seams parallel to the roadway should not be located on the portion of the road where bicycling is expected. Utility covers and drainage grates should be flush with the pavement surface and should be adjusted with pavement overlays. Approaches to railroad crossings should be improved as necessary to provide for safe bicycle crossings.

Pavement surfaces should be smooth, and the edge of the pavement should be uniform. Narrow slots in the surface that could catch a bicycle wheel, such as a gap in the longitudinal joint between two concrete slabs, should not be more than 1/2 inch wide. Ridges in the pavement that could cause people riding bicycles to lose control should not be more than 3/8 inch high when parallel to travel or 3/4 inch high when perpendicular to travel.

When pavement is overlaid, the edge of the overlay should be matched to the height of the adjacent pavement or smooth transitions should be provided.

BICYCLE TRAVEL THROUGH CONSTRUCTION ZONES

The following general considerations apply to accommodating bicyclists in construction zones:

- Where construction is occurring on a street that already has a bicycle lane, the area through which the construction is occurring should maintain that space.
- Every effort should be made to avoid using bicycle lanes for staging of site construction work or temporary construction signage.
- Minimize the time that construction work occupies bicycle lanes. For example, if the added work space is only needed for operation of a crane for a limited number of days that will be the only time that occupancy of the bicycle lane is permitted.
- Where bicycles lanes are not present, provide a shared vehicle lane as wide as physically feasible.
- If a bicycle lane is taken or if the area used by bicyclists is impacted by construction, contractors must use the "Bikes May Use Full Lane" sign, standard R4-11 MUTCD sign. Orange signage in construction zones is preferred.
- If the disruption occurs in a bicycle lane over a short distance (approximately 500 feet or less), bicyclists may be routed to share a motor vehicle lane (as wide as possible).
- If the disruption occurs over a longer distance (more than 500 feet), and on busy roadways, a temporary bicycle lane should be provided. In the event that it is not possible to provide a temporary bicycle lane, provide a wide outside lane (at least 14 feet wide). If neither of these is possible, provide ramps to allow bicycles to access the sidewalk within the construction zone (provided the site is not within one of the zones where sidewalk bicycle riding is prohibited).
- Bicyclists should not be specifically directed onto sidewalks with pedestrians unless there is no reasonable alternative.

Figure 9.3: "Bikes May Use Full Lane" sign, MUTCD R4-11

CONSIDERATIONS FOR STREET DISRUPTIONS AND CONSTRUCTION

Metal plates create a slick and dangerous surface for bicyclists, and are not easily visible at night or in the rain.

- Advance warning signs (Caution – Metal Plates Ahead) may be required to be posted if conditions warrant.
- It is preferable that the plates be recessed so that the top of the plate is level with the adjacent pavement.
- Where this is not possible, provide a temporary bituminous concrete lip painted reflective pink all around the plate to alert bicyclists to a road hazard.
- All metal plate edges should be painted with high visibility (reflective pink) paint.
- Type II or II Barricades (see MUTCD for description) with flashers should be placed at least 20 feet in advance.
- Steel plates should have a non-slippery textured surface; this is required within an intersection or a crosswalk.

Construction excavations or depressions should never be left without physical barriers preventing bicyclists from falling in.

- The preferred treatment is the provisions of temporary fill and a temporary bituminous concrete patch.
- Where the excavation is outside the motor vehicle and bicycle lanes, provide traffic barriers (concrete barriers, barricades, or where the depression is less than 18 inches, cones or barrels may be used)

Figure 9.4: Street repaving zone featuring manholes painted with reflective pink paint.

- If the excavation must be maintained for more than two days and it is located within lanes to be used by bicyclists, temporary steel plates may be used. See guidelines for the use of metal plates above.

Narrow cuts that are parallel with the direction of travel create an extreme hazard for bicyclists, whose tires could get caught. These should never be made and left in an area where bicyclists will be traveling. If necessary, they should be blocked off and bicyclists routed around the hazard.

+ **When performing advance pavement cutting for trenching or other roadway excavation, use only saw cutting (approximately 1/4 inch or narrower).**

Site access and ramps: Temporary (usually asphalt) ramps are sometimes proposed to access a site from a sidewalk where no driveway or other vehicle access exists. The creation of ramps in the roadway is not desirable unless being created in an area that is otherwise used by on-street parking. If necessary for pedestrian accessibility reasons, the ramp edge will be painted pink and/or a barricade placed alongside so a person bicycling does not inadvertently run into it.

Raised castings: After cold planing of pavement is performed, utility castings (e.g., manhole covers, valve box covers, and catch basin grates) will be 1 to 2 inches higher than the surrounding pavement. This presents a hazard for bicyclists and motor vehicles alike. This condition will also occur during roadway construction just before the next lift of pavement is to be placed. Wherever raised casting are present, the following should be provided:

+ **Provide advance warning signs saying: "Caution – Raised Castings Ahead."**

+ **Spray paint reflective pink on the raised portions of the castings.**

Figure 9.5: Construction zone featuring temporary bike lane.

Cold planing and pavement installation: After cold planing, there is a vertical lip at the limits of pavement removal. A smooth bituminous transition slope should be provided to eliminate the jarring hazard of hitting the vertical lip. In roadway construction, there may be a similar vertical lip between the different lifts of pavement installed. In these conditions, a similar transition is also needed.

+ **Provide advance warning signs saying: "Bump" at these transitions.**

+ **Paint the transition sloped area in reflective pink.**

Pavement Sweeping and Debris Removal: Road surfaces in construction zones may experience a greater build-up of debris than other roadway segments. Special attention must be given to keeping roadways surfaces free of debris, including sand, gravel, stones, trash, and miscellaneous construction debris. Pavement in construction zones should be swept to maintain a reasonably clear riding surface in bicycle lanes and in the outer 5 or 6 feet of roadway.

Pot holes: Pot holes are more likely to be found in construction zones due to the impact of construction equipment and due to temporary pavement patching. Special attention must be given to monitoring for the development of pot holes and for promptly filling in and patching pot holes.

Temporary Traffic Sign Placement: The placement of advance construction signs must not obstruct bicyclists' path. In particular, temporary signs shall not be placed in bicycle lanes.

Restoration of Pavement Markings: As soon as reasonably possible after paving, install pavement markings, particularly bicycle lanes markings and other markings associated with bicycle facilities.

Figure 9.6: Construction crew installing bicycle decal and green pavement markings.

CHAPTER 10

NEXT STEPS

Achieving the vision and goals of this bicycle plan will depend on the implementation of the many varied elements outlined throughout the document. Highlighted here are the key priority initiatives that are either underway or to be undertaken in the near term.

ONGOING WORK

- Prioritize the development of new bicycle facilities based on the Bicycle Network Vision.
- Incorporate the Bicycle Network Vision in the City's Five Year Street and Sidewalk Improvement Plan prioritization process and evaluated annually.
- Update the Bicycle Network Vision annually in connection with the timing of the Five Year Plan for Street and Sidewalk Reconstruction.
- Infrastructure improvements and mitigation measures undertaken by private development projects will be guided by the Bicycle Network Vision.
- Review bicycle counts and crash analyses annually.
- Review and update the Next Steps/Action Plan annually.
- Develop an overlay map of streets that are expected to be at or reach BLC 3 but also represent key routes for bicycling and thus should receive extra attention in the infrastructure planning efforts

CURRENT INITIATIVES

ALEWIFE PEDESTRIAN/BICYCLE BRIDGE

- Complete feasibility study for placement of bridge.

GRAND JUNCTION RAIL-WITH-TRAIL

- Complete drafting of Pathway Overlay District zoning regulations for trail corridor.
- Construct a portion of path between Main Street and Broadway (Cambridge Redevelopment Authority).
- Complete design of path between Broadway and Binney Street in conjunction with new park.

WATERTOWN-CAMBRIDGE GREENWAY

- Complete design of the Watertown-Cambridge Greenway rail to trail (Department of Conservation and Recreation).

SPOT IMPROVEMENTS

Over the past two years, the City budget has set aside funds for small infrastructure improvements that are more significant than minor maintenance projects yet don't fall into any larger project.

- Continue to make spot improvements on an ongoing basis.

BICYCLE PARKING

+ Add additional public bicycle parking throughout the city, particularly in business districts.

+ Install additional public sheltered public bike parking in key locations.

HUBWAY BIKE SHARE

+ Add new Hubway stations throughout Cambridge (15 new stations in 2015-16).

+ Enhance targeted outreach to underrepresented communities.

EDUCATION AND OUTREACH

Expanded efforts in public schools through the Safe Routes to School program include:

+ Focused programs for upper school students

+ Expansion of specialized bicycle education program in the high school with on-bike skills class for urban bicycling, piloted in 2015.

+ Expanded bicycle training classes, in addition to current opportunities

For the broader population:

+ Expand education for underrepresented groups: women; immigrants/non-native English speakers; lower income

+ Engage with the city youth centers

NEW INITIATIVES

BICYCLE COUNTER

The counter, installed in Kendall Square in June 2015, will collect data on bicycle usage, display the daily and cumulative totals on the street monitor for travelers to view, and provide data available for public access via a website.

WAYFINDING

Develop strategy to enhance people's ability to find convenient and comfortable routes to their destinations.

BICYCLE FRIENDLY COMMUNITY REAPPLICATION

Determine when to reapply for the Bicycle Friendly Community Designation with the intention of reaching Platinum status.

NEW OPPORTUNITIES FOR PUBLIC INPUT

Given the popularity of the on-line WikiMap used to collect public comment during the Bicycle Plan process, the City will experiment with a similar map to allow people to make comments on an ongoing basis, in order to make it easier for people to provide feedback and for the comments to be readily summarized. The suggestions and comments will be evaluated for action or information. This is not to be used in the same way as iReport; see the WikiMap Action Items in Appendix F from the Bicycle Plan process as an example of how the information will be used.

SIGNALS, SIGNS, AND MARKINGS

Evaluate how signals, signs and markings can better support people on bicycle at intersections. Tools that will be looked at in greater depth include bicycle specific signals, bike boxes, "two-leg" bicycle turns, and the potential for creating leading intervals for bicyclists at appropriate locations.

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APPENDICES

APPENDIX A: POLICIES

VEHICLE TRIP REDUCTION ORDINANCE (TEXT INCLUDED IN APPENDIX)

https://www.municode.com/library/ma/cambridge/codes/code_of_ordinances?nodeId=TIT10VETR_CH10.17VETRREOR

PARKING AND TRANSPORTATION DEMAND MANAGEMENT PLAN (TEXT INCLUDED IN APPENDIX)

https://www.municode.com/library/ma/cambridge/codes/code_of_ordinances?nodeId=TIT10VETR_CH10.18PATRDEMAPLPASPRE

GROWTH POLICY

http://www.cambridgema.gov/~/media/Files/CDD/Planning/GrowthPolicy/growth_policy_2007.pdf

CLIMATE PROTECTION PLAN

http://www.cambridgema.gov/~/media/Files/CDD/Climate/climateplans/climate_plan.pdf

ZONING ORDINANCE

http://www.cambridgema.gov/~/media/Files/CDD/ZoningDevel/Ordinance/zo_article19_1363.ashx

ATTACHMENT A

Chapter 10.17

VEHICLE TRIP REDUCTION ORDINANCE

Sections:

10.17.010	Time period of chapter.
10.17.020	Findings.
10.17.030	Definitions.
10.17.040	Expanded commuter mobility program.
10.17.050	Bicycle and pedestrian mobility program.
10.17.060	Restrictions on visitor passes.
10.17.070	Fees for residential parking stickers.
10.17.080	Study of zoning revisions.
10.17.090	Improved coordination with MBTA.
10.17.100	Regulation of idling buses, trucks, and taxis and automobiles.
10.17.110	Taxicab improvements.
10.17.120	Alewife Station and Garage.
10.17.130	Pilot survey of commuting characteristics of City employees and employees of selected employers.
10.17.140	Consultation with employers and residents about employer vehicle trip reduction program.
10.17.150	Use of fees.
10.17.160	Recommendations for a SIP amendment applicable to all communities in the Commonwealth.
10.17.170	Municipal vehicle trip reduction plans.
10.17.180	Expansion of local employment opportunities.
10.17.190	Further expansion of commuter mobility program.
10.17.200	Restrictions on parking supply.
10.17.210	Promotion of clean fuels.
10.17.220	Development of traffic policy.
10.17.230	Sunset clause.

10.17.010 Time period of chapter.

Sections 10.17.040 through 10.17.180 of this chapter shall take effect sixty days after final approval by the City Council. The remaining provisions shall not take effect until, and shall at that time supersede and replace Chapter 10.16, sixty days after final approval by the U.S. Environmental Protection Agency ("U.S. EPA") of a SIP amendment for Massachusetts which (i) contains a program of transportation control measures that are imposed equally on all communities in the Commonwealth such as an employer-based vehicle trip reduction program; and (ii) revokes any provisions of 40 C.F.R. Section 52.1135 that are applicable to Cambridge. (Ord. 1139 (part), 1992)

10.17.020 Findings.

The City of Cambridge finds and determines that:

A. High levels of vehicle traffic and congestion add to air pollution, noise, and inconvenience and erode the quality of the living and working environment.

B. An increasing number of automobile registrations and jobs in the City has resulted in growth of traffic in and around Cambridge.

C. While the City has pursued programs to mitigate these conditions, new measures must be implemented by the City and the Commonwealth involving the participation of all sectors of the community on a local and regional bases to make more efficient use of mass transit, bicycling, walking, and other alternatives to trips by single-occupancy vehicles.

D. The Clean Air Act amendments of 1990 call for the attainment of compliance with the National Ambient Air Quality Standard for Ozone within the Commonwealth by 1999.

E. Attainment of the Ozone

Standard will require increased control of vehicle-related air pollution ("transportation control measures") throughout the Commonwealth, as well as the Nation.

F. Throughtrips and other traffic over which Cambridge has no control contribute significantly to the degradation of air quality in the region. The degradation of air quality, particularly ozone, is a regional problem which requires global and regional solutions.

G. A large portion of vehicle traffic on Cambridge streets is attributable to trips that neither originate nor end in Cambridge ("throughtrips"). The City of Cambridge has virtually no control over these throughtrips. Accordingly, it is imperative that DEP amend the SIP to include transportation control measures applicable equally to all communities in the Commonwealth, including an employer-based vehicle trip reduction program, to achieve reductions in the number of vehicle trips and vehicle miles travelled throughout the region.

H. Increasing the use of commuting alternatives and reducing the number of trips by single-occupancy vehicles is beneficial for the City and the Commonwealth in reducing vehicle miles travelled, traffic and associated air pollution, fuel use, noise, and congestion.

I. Programs offered through City Departments, employers, institutions, owners of multiple-tenant buildings and complexes and other organizations to encourage the use of mass transit, bicycling walking, and other alternatives to commuting by single-occupancy vehicles are effective and should be expanded on a citywide and regional basis.

J. The approach which includes, where consistent with employers' needs, adoption and enforcement of driving disincentives, particularly those applicable to the regular work-day commuter, and best suited to accommodate the diverse needs and capabilities of the governmental, business and institutional communities in the City, and recommended for adoption by DEP for state-wide application is a flexible approach which establishes performance coals and permits government and private employers, institutions, and automobile owners to select from among a variety of measures designed to contribute toward reaching the goals.

K. The vehicle trip reduction program recommended for adoption by DEP on a state-wide basis should give credit to those employers which have already made substantial progress in encouraging the use of mass transit, bicycling, walking, and alternative means of commuting and in providing such alternatives.

L. Measures to discourage, and provide alternatives to, vehicle trips and trips by single-occupancy vehicles made by residents of and visitors to Cambridge are also necessary to further the goals of the Clean Air Act.

M. Some of the measures contained in this chapter will achieve immediate reductions in vehicle miles travelled; others are designed to collect information and otherwise lay the foundation for future actions to reduce vehicle miles travelled and improve air quality. To maximize air quality benefits, some types of transportation control measures must be adopted and applied on a regional basis. (Ord. 1139 (part), 1992)

10.17.030 Definitions.

A. "City" means the City of Cambridge, Massachusetts.

B. "Clean fuel" means any fuel or power source used in a vehicle that complies with the applicable standards for clean fuel vehicles contained in Sections 241-245 of the Clean Air Act, 42 U.S.C. §§ 7581--7595.

C. "Clean-fuel vehicle" means

a vehicle in a class or category of vehicles which has been certified to meet the applicable clean-fuel vehicle standards as defined by and pursuant to the federal Clean Air Act Amendments of 1990.

D. "Fleet" means ten or more vehicles which are (i) owned, leased, controlled or operated by a single person or entity; or (ii) parked at the same location, excluding vehicles held for lease or rental to the general public, vehicles held for sale by dealers, vehicles used for law enforcement or emergency purposes.

E. "Ozone standard" means the National Ambient Air Quality Standard for Ozone established pursuant to Section 109 of the Clean Air Act, 42 U.S.C. § 7409.

F. "Region" means those communities east of, or through which Route 128 passes.

G. "Selected employers" means those employers in Cambridge who voluntarily agree to participate in the pilot survey of employee commuting characteristics set forth in Section 10.17.130.

H. "Throughtrips" means vehicle traffic on City of Cambridge streets attributable to trips that neither originate nor end in the City of Cambridge.

I. "Transportation control measures" are transportation control strategies aimed at reducing transportation related emissions of pollutants and controlling the growth of future vehicle trips and vehicle miles travelled.

J. "VMT" is an abbreviation for vehicle miles travelled.

K. "AER" is an abbreviation for automobile efficiency rate, a rate determined as set forth in Section 10.17.130(D).

L. "Base AER" is a term for the automobile efficiency rate for the City of Cambridge, more fully described in Section 10.17.130(E). (Ord. 1139 (part), 1992)

10.17.040 Expanded commuter mobility program.

In addition to continuing activities currently in progress, the Commuter Mobility Coordinator shall develop and submit to the Assistant City Manager for Community Development and the City Manager a schedule for implementing additional programs including, but not limited to:

A. A bicycle commuter program, in conjunction with the Traffic and Parking Department and the Bicycle Advisory Committee involving consultation with Cambridge residents and businesses;

B. A program to assist employers in establishing bicycle commuting incentives;

C. A feasibility study of the potential use of an in-City paratransit system of jitney services or shuttles to transit locations, areas of major employment, and major commercial/retail destinations; and

D. A program for publicizing successes achieved by businesses and institutions in decreasing the number of single-occupancy vehicle commuters to their establishments;

E. An education program, including newspaper articles, cable television programs, and public meetings, to inform residents and employees of the need for, and the benefits to be realized from, changes in commuting behavior;

F. The beginning of a commuter ride-share program;

G. A program to encourage businesses to offer discounts on T passes.

The City will provide adequate resources to enhance the ability of the commuter mobility program to work to reduce the vehicle miles travelled in Cambridge. (Ord. 1139 (part), 1992)

10.17.050 Bicycle and pedestrian mobility

program.

The position of Bicycle and Pedestrian Coordinator is created within the Traffic and Parking Department. The City Manager shall, within one month of the effective date of this provision, designate the Bicycle and Pedestrian Coordinator. The Bicycle and Pedestrian Coordinator shall devote at least fifty percent of his/her time to carrying out the tasks required by this provision. The Bicycle and Pedestrian Coordinator shall, in conjunction with the Commuter Mobility Coordinator and the City's existing Bicycle Advisory Committee, (i) design and implement a program to encourage greater use of bicycles as alternatives to single-occupancy vehicles within the city and, (ii) focus the attention of the City on the needs of pedestrians. The program will include, but is not limited to:

A. Development of a Cambridge Bicycle Master Plan;

B. Development of a Cambridge Pedestrian Master Plan;

C. Development and evaluation of recommendations for a regional network of bicycle paths and bicycle priority streets favoring both bicycles and pedestrians;

D. Consultation with Cambridge residents, businesses, institutions and property owners;

E. Funding of bicycle amenities and storage facilities;

F. Funding for pedestrian amenities; and

G. Provision of bicycles for use by City police and Traffic and Parking Department.

The program shall be funded at an initial level of twenty-five thousand dollars annually; these funds shall be in addition to, and not utilized for, the salary of the Bicycle and Pedestrian Coordinator. (Ord. 1139 (part), 1992)

10.17.060 Restrictions on visitor passes.

A. Official City Visitor Passes. The Citywide visitor passes that have been distributed to authorized individuals will be invalid thirty days after the effective date of the ordinance codified in this provision. The Traffic and Parking Department is authorized to issue stickers to individuals or organizations or who would be authorized to receive a Citywide visitor pass. A list of all recipients of Citywide visitor passes shall be maintained by the Traffic and Parking Department and shall be made available for public inspection upon request. In order to be effective, a sticker must be affixed to a vehicle and must display the vehicle registration number and an expiration date. These stickers shall be easily distinguishable from the stickers issued to City residents. No Official City Visitor Sticker shall be issued that is valid for a time period longer than one year. The names of individuals and organizations shall be available to the public upon request. The list shall be updated by the Department at least quarterly.

B. Residential Visitor Passes. Beginning on the January first following the effective date of this provision, each residential visitor pass issued by the Traffic and Parking Department shall be designed to display a calendar for the year during which it is valid. To be valid on a given date, the pass must be displayed in the windshield and the date of use must be circled. (Ord. 1146, 1992; Ord. 1139 (part), 1992)

10.17.070 Fees for residential parking stickers.

The fees for residential parking stickers shall be eight dollars per permit per household. (Ord. 1147, 1992)

10.17.080 Study of zoning revisions.

The Cambridge Planning Board

(the "Board") shall consider revising the required parking space ratios specified in the City Zoning Ordinance and shall evaluate the effectiveness of such revisions in reducing VMT and traffic congestion and encouraging the increased use of commuting alternatives other than by single-occupant vehicles. The Planning Board shall evaluate the need to reduce the allowed densities to achieve the goal of reduced vehicle miles travelled and shall also consider eliminating the exclusion of parking in the calculation of gross floor area. The Board shall also consider the economic impact of such revisions. Consideration shall be given, without limitation, to such potential revisions as reduction of minimum and maximum parking requirements, special provisions for carpools and vanpools, and encouragement of mixed-use developments.

The Board shall invite testimony from residents, businesses, institutions, and property owners and shall publicly report its recommendations within one year of the effective date of this provision. (Ord. 1139 (part), 1992)

10.17.090 Improved coordination with MBTA.

The City Manager shall initiate meetings with the General Manager of the MBTA to map out a strategy for close cooperation between the City and the MBTA on increasing public transportation services to and within the City. The management of the MBTA will be asked to work to improve existing services and to look into ways in which the MBTA can be of assistance to the City in exploring possible development of a local para-transit system. There shall be a goal of establishing a working joint committee to implement the needed improvements.

The Commuter Mobility Staff shall undertake a survey of residents and commuters to identify barriers to use of the MBTA. The Commuter Mobility Staff shall also conduct widely-advertised public forums in neighborhoods throughout the City. Based on the survey and the results of the public meetings, the Commuter Mobility Staff will make recommendations for improving MBTA service. The recommendations will be available to the public for comment. The Commuter Mobility Staff will request that the MBTA hold one or more public meetings to discuss the recommendations.

The Department of Traffic and Parking and the Commuter Mobility staff shall work with MBTA to (i) improve public transportation schedules and routes; (ii) to improve bus stop signage; and (iii) to review placement of bus stops. The Cambridge Traffic and Parking Department shall also cooperate with the MBTA in an attempt to have the MBTA, at the sites selected by Cambridge, erect bus stop signs that are used in other cities and towns.

Meetings with representatives of the MBTA should also focus on conversion of buses to clean fuels. (Ord. 1139 (part), 1992)

10.17.100 Regulation of idling buses, trucks, and taxis and automobiles.

The Police Department shall promptly review and improve its enforcement of the statutory prohibitions against idling by busses, trucks and taxis and automobiles set forth at G.L., ch. 90, § 16A. Within two months of the effective date of the ordinance codified in this provision, the Commissioner of the Police Department shall report to the City Manager on the Department's implementation of this provision. (Ord. 1139 (part), 1992)

10.17.110 Taxicab improvements.

The License Commission, through the Taxicab Advisory Committee shall consult with the taxicab industry, residents,

and commercial establishments in the City and prepare recommendations:

A. To make taxicabs more accessible for use by multiple passengers with different destinations. The object of this recommendation shall be to decrease single-occupant use of taxicabs by providing monetary incentives for the taxicab drivers and reducing the cost for passengers; and

B. About the potential role of taxicabs in a paratransit system for the City; and

C. About conversion of taxi fleets to clean fuels;

D. for new or relocated taxi stands; and

E. For policies or actions that would encourage Cambridge residents to use taxicabs that are licensed in Cambridge instead of taxicabs from other cities. (Ord. 1139 (part), 1992)

10.17.120 Alewife Station and Garage.

The Assistant City Manager for Community Development or his designee shall consult with Alewife neighborhood groups, employers, and other interested persons concerning the demand for (i) a commuter rail station at Alewife, (ii) an expansion of the Alewife garage, and (iii) shuttle bus or van service between Alewife Station and nearby employment sites and stores. The Assistant City Manager shall report his findings to the City Council within one year of the effective date of this provision. (Ord. 1139 (part), 1992)

10.17.130 Pilot survey of commuting characteristics of City employees and employees of selected employers.

A. The City, in consultation with the Selected Employer Steering Committee, shall develop an Employer Survey Kit which may include an Employee Survey Form, administration plan, and Automobile Efficiency Rate ("AER") (defined below) calculation sheet, designed to elicit commuting data from all City employees and employees of Selected Employers which will permit the calculation of an actual AER for each Selected Employer and City Department and will also provide the statistical basis for determining such other characteristics of commuting patterns as may be useful in designing measures to achieve the goals of the Clean Air Act. The Employer Survey Kit shall be prepared and distributed to City Departments and Selected Employers within six months of the effective date of the ordinance codified in this provision. Each City Department and Selected Employer shall distribute copies of the Employee Survey Form to, and as a goal shall endeavor to collect completed forms from, seventy-five per cent of its employees. Each City Department and Selected Employer shall, no later than three (3) months from the date the Employer Survey Kit is distributed, submit to the Assistant City Manager for Community Development all completed Employee Survey Forms, provided that, any Selected Employer may instead submit a report of the results of the employee survey on a standard AER calculation sheet, signed and certified as to its accuracy by an officer of the Company. A Selected Employer that does not submit the Employee Survey Forms shall retain such forms for a minimum of three years. These forms shall be made available to the Assistant City Manager for Community Development or his designee, upon request.

B. The Selected Employer Steering Committee shall:

1. Participate with the City in the design of the pilot survey;

2. Assist in educating and encouraging participation of the selected employer group;

3. Review with the City the results of the pilot survey; and

4. Participate in the design of

any City-wide employer based vehicle trip reduction program.

C. Each City Department and Selected Employer shall cooperate with the Assistant City Manager for Community Development and the Commuter Mobility Staff in providing information about plans and programs being utilized to encourage commuter travel modes other than by single occupancy vehicles. At such time as the City implements or enforces an employer-based vehicle trip reduction program on a city-wide basis, each City Department and Selected Employer which has cooperated with the Community Development Department and the Commuter Mobility Staff and which has complied with paragraph "A" hereof shall be entitled to use the AER reflected in its initial Employer Survey Response as its baseline AER regardless of the extent of improvements in its AER produced as a result of its cooperation with the Community Development Department or its own commuter mobility initiatives.

D. The Assistant City Manager for Community Development shall make arrangements with the Commuter Mobility Staff to coordinate: (i) participation of the Selected Employers; (ii) preparation and distribution of the Employer Survey Kits; (iii) calculation of the base AER; (iv) review and tabulation of the pilot employer survey responses; (v) recalculation of the base AER based on review and analysis of the pilot employer survey responses. The Assistant City Manager for Community Development shall have the authority to engage the services of technical consultants to assist with these tasks.

E. The phrase Automobile Efficiency Rate ("AER") shall mean the figure calculated by dividing the number of employees who report to a worksite within the City of Cambridge between six a.m. and ten a.m. (inclusive Monday through Friday to achieve a five consecutive weekday average) by the number of vehicles used by those employees to reach the worksite during those hours. Bicycles, public transit vehicles, and approved clean-fuel vehicles shall be excluded from the vehicles counted. Motorcycles and light trucks shall be included in the vehicles counted.

F. The City shall define and make calculations of a base AER for the City of Cambridge as a whole. Such base AER shall initially be derived from the 1990 Census modal share data and travel statistics, the results of the pilot survey of selected employers, and such other data as may be relevant. Subsequently, the City may develop other AERs for categories such as geographical areas of the City, employer types, employer sizes, and the like, as may be determined through the consultative process provided for in Section 10.17.140. The City may also, through the same consultative process, periodically recalculate the base AER or such other AERs to reflect additional data or changes in data as become available.

G. The term "carpool" shall mean a private motor vehicle occupied by two to six employees travelling together for at least seventy-five percent of their commute trip distances.

H. The term "commute alternatives" shall mean carpooling, vanpooling, private bus service, use of public transit, bicycling and/or walking.

I. The term "employee" shall mean any person hired by a public or private employer, including part-time and seasonal employees, who reports to work at least two days a week during five or more months of the year.

J. The term "worksite" shall mean a building or grouping of buildings which are located within the City of Cambridge and are on physically contiguous parcels of land or on parcels separated solely by private or public roadways or rights-of-ways and which are owned, operated, or leased by the same

Employer. (Ord. 1139 (part), 1992)

10.17.140 Consultation with employers and residents about employer vehicle trip reduction program.

The Assistant City Manager for Community Development or his designee shall consult with Cambridge businesses, institutions, City departments, the Selected Employer Steering Committee, and residents to evaluate recommendations for a regional employer-based vehicle trip reduction program. During this consultation process, issues to be considered shall include:

A. Whether different areas of the City should be subject to different AER goals, depending on their proximity to public transit;

B. What the annual rate of improvement in the AER goal should be;

C. which, if any of the vehicle trip reduction plan elements identified in Section 10.17.170 should be required to be implemented by all employers in the City;

D. The definition of base AER and the potential appropriateness and definition of AERs for categories such as geographical areas of the city, employer types, employer sizes, and the like;

E. Ways to recognize the uniqueness of employers and their differing needs for employee mobility;

F. Appropriate AER or other references to be used in setting goals for Cambridge employers within a regional vehicle trip reduction program;

G. Whether employers should be required to achieve a base or other AER goal within a specified time period or whether penalties should only be imposed for an employer's failure to implement its plan;

H. Identification and development of mechanisms for transferring and/or sharing use of parking spaces as demand for parking spaces decreases at a given worksite;

I. Evaluation of potential impacts on employment and economic impacts on affected employers and on the City of any proposed measures; and

J. Whether any categories of employers should be exempt. (Ord. 1139 (part), 1992)

10.17.150 Use of fees.

One hundred percent of the funds raised through the sale of residential parking stickers shall be used for implementing the tasks and programs specified in this chapter. (Ord. 1139 (part), 1992)

10.17.160 Recommendations for a SIP amendment applicable to all communities in the Commonwealth.

In order to ensure that the vehicle trip reduction measures in the ordinance codified in this chapter achieve their intended effect of reducing vehicle miles traveled and enhancing air quality in the Commonwealth, the City shall include in its submittal to the Metropolitan Planning Organization ("MPO") and DEP recommendations for an amendment to the State Implementation Plan under the federal Clean Air Act applicable equally to all communities in the Commonwealth. These recommendations shall include, but not be limited to:

A. A proposal for an employer-based vehicle trip reduction program;

B. A proposal for measures applicable to new development projects to mitigate the traffic impacts of such projects and reduce vehicle miles travelled to and from such projects;

C. A proposal for revising state taxing policies concerning employer-paid transportation and parking subsidies;

D. A proposal for evaluating

the utility of imposing fees on single-occupant commuter vehicles and/or commuter parking;

E. A proposal for achieving appropriate convenient public transportation from the west and north to Cambridge, including but not limited to support of a circumferential transit system;

F. Preventing the diversion of traffic oriented toward Cambridge to other areas with more limited transit availability;

G. Assuring that Cambridge is not placed at a competitive disadvantage within the region or the Commonwealth;

H. Reducing the growth in volume of throughtrips on Cambridge roadways which is outside the control of the City; and

I. Improved and extended use of water taxis.

Notwithstanding the foregoing, the City in its submittal shall note the absence of consensus about the vehicle trip reduction ordinance as originally proposed. The City shall engage in a further consultation process as outlined in Section 10.17.140. The City shall continue to update the State concerning that process. (Ord. 1139 (part), 1992)

10.17.170 Municipal vehicle trip reduction plans.

Based on its review of the employee survey forms collected pursuant to Section 10.17.130, the Commuter Mobility Staff shall prepare a vehicle trip reduction plan for implementation by City Departments. The plan shall contain a program of measures identical to the program developed after consultation as set forth in Section 10.17.140 which shall be designed to reduce vehicle trips and vehicle miles travelled by municipal employees and thereby improve the City's AER, as computed on the annual AER calculation sheets. The plan may include a variety of measures including, but not limited to:

A. Dissemination and periodic updating of information on all available transit service to and from the worksite;

B. Advertising, promoting and making available for purchase on the worksite any pass program offered by transit authorities;

C. Recommendations to individual employees of employee-specific travel options to reduce VMT;

D. Incentives and assistance for bicycle commuting including secure parking facilities, shower/changing facilities, and education and training programs;

E. Coordinating, facilitating and providing subsidies for employer-sponsored rideshare programs;

F. Preferential parking for carpools and vanpools;

G. Transportation allowances;

H. Expanding opportunities for alternative work schedules including four-day weeks and flexible schedules to facilitate ridesharing;

I. Elimination or reduction of parking subsidies for single-occupant vehicles;

J. Shuttle service to transit stops; and/or

K. Elimination of employee parking spaces.

After consultation with the Assistant City Manager for Community Development and the City Manager about the plan, the Commuter Mobillty Staff shall promptly distribute it to City Departments for implementation. The Commuter Mobility Staff shall assist City Departments with implementation of the plan. (Ord. 1139 (part), 1992)

10.17.180 Expansion of local employment opportunities.

To demonstrate and further its commitment to increase the number of Cambridge residents employed by

Cambridge businesses and reduce vehicle miles associated with work commutes, the annual budget for expansion of local employment opportunities shall be increased to two hundred thirty thousand dollars. That budget shall be applied as follows:

A. To continue and expand the Cambridge Employment Program within the Community Development Department;

B. To sponsor an annual job fair to inform residents of local employment opportunities;

C. To sponsor and coordinate educational partnerships between Cambridge employees and schools in Cambridge; and

D. To develop a Local Employment Opportunity Plan.

These functions shall be coordinated and carried out by the Community Development Department in conjunction with the Department of Human Services and under the supervision of the Assistant City Manager for Community Development. The Local Employment Opportunity Plan shall be developed within one year of the effective date of the ordinance codified in this provision

[THE FOLLOWING SECTIONS, 10.17.190 THROUGH 10.17.220, ONLY TAKE EFFECT AFTER STATE AND FEDERAL ACTION TO ADOPT A REGIONAL OR STATE-WIDE PROGRAM]

10.17.190 Further expansion of commuter mobility program.

The Assistant City Manager for Community Development, in consultation with the City Manager, shall have authority to hire additional staff to implement the tasks and programs specified in this Chapter. Within three months of the effective date of this provision, at least one additional Commuter Mobility Staff member shall be hired. The Commuter Mobility Coordinator shall develop and promptly implement additional programs including but not limited to:

A. A program encouraging the use and sharing of computer ride-sharing information between and among businesses and institutions in the City;

B. A program to encourage commercial and retail businesses to offer discounts to patrons with MBTA transit passes; and

C. Implementation of an in-city paratransit system, to the extent funds are available, to supplement MBTA services.

The Commuter Mobility Coordinator shall develop and recommend additional programs, including but not limited to, a residential trip reduction program for apartment and condominium complexes of fifty or more units. (Ord. 1139 (part), 1992)

10.17.200 Restrictions on parking supply.

A. Expansion of Parking Regulation. Within six months of the effective date of the ordinance codified in this provision, the Traffic and Parking Department shall submit to the City Manager an updated written inventory of all on-street parking spaces specifying the restrictions applicable to each such parking space. As to any space which has not been restricted or removed from the supply of on-street spaces pursuant to Section 10.16.071 of this title, the Traffic and Parking Department shall prepare a recommendation for restriction of each such space to discourage its use for long-term commuter parking. These restrictions may include, without limitation an absolute prohibition against parking, installation of parking meters, imposition of time restrictions, and/or restrictions for use by residents with permits. The Director of Traffic and Parking shall make the

recommendations available for public review and shall schedule one or more public meetings, as appropriate, for public discussion of the recommendations. Within one month after the public meetings, the Traffic and Parking Department shall submit its revised recommendation to the City Manager. After consultation with the City Manager, the Traffic and Parking Department shall promptly implement the recommendations.

B. Municipal Parking Rates. The rates for daily and monthly parking at all City-owned off-street parking facilities shall be increased by twenty-five percent over current rates, to be effective within sixty days of the effective date of this provision.

C. Exclusive Residential Parking Near MBTA Stations. The Traffic and Parking Department, in consultation with neighborhood groups, residents, commercial establishments, and the City Manager, shall prepare a proposal for establishing exclusive residential parking zones on primarily residential streets located near MBTA stations. The object of the proposal shall be to limit residential parking on targeted streets close to MBTA stations to residents of those neighborhoods by means of appropriate signage and special resident stickers. The Traffic and Parking Department shall convene a public meeting on its proposal within four months of the effective date of this provision. Within one month after such public meeting, and after consultation with the City Manager, the Director of Traffic and Parking shall cause the proposal to be implemented. (Ord. 1139 (part), 1992)

10.17.210 Promotion of clean fuels.

The Department of Public Works shall study, promote, encourage, and identify incentives for the use of clean fuel in fleets of vehicles operating within the City. The study shall include an evaluation of the use of such fuels as methanol, compressed natural gas, and reformulated gasoline based on characteristics of fleets in Cambridge and implementation costs. The study shall also identify reasonably available incentives which could be offered by the City, such as tax credits, to encourage use of clean fuel in fleets of vehicles. The sum of fifteen thousand dollars shall be appropriated for this program. (Ord. 1139 (part), 1992)

10.17.220 Development of traffic policy.

The Assistant City Manager for Community Development and the Director of the Traffic and Parking Department, or their designees, shall within one year of the effective date of this provision, conduct a study of major highways, city through streets, streets with schools, different types of residential streets, and streets at the borders of the City. Based on that study, they shall prepare a written recommendation of:

A. Appropriate speeds and volumes for Cambridge streets; and

B. Means of encouraging travel and traffic patterns that reduce VMTs.

This written recommendation shall be submitted to the City Council for review and appropriate action. (Ord. 1139 (part), 1992)

10.17.230 Sunset clause.

The provisions of this chapter shall cease to be effective ninety days after the date the Department of Environmental Protection or the U.S. Environmental Protection Agency adopts a final rule or regulation that imposes transportation control measures including parking supply management measures in Cambridge which do not have an equal impact on the Region. The purpose of this sunset clause is to give the City the opportunity to decide whether to continue to implement the numerous

provisions of this chapter in the event that the final rule or regulation puts the City at a competitive disadvantage in the region. (Ord. 1139 (part), 1992)

ATTACHMENT B

Chapter 10.18

PARKING AND TRANSPORTATION DEMAND MANAGEMENT PLANNING; PARKING SPACE REGISTRATION

Sections:

10.18.010	**Purpose.**
10.18.020	**Definitions.**
10.18.030	**PTDM Planning Officer.**
10.18.040	**Registration of All Parking Spaces.**
10.18.050	**Parking and Transportation Demand Management Plans.**
10.18.060	**Reduction in Minimum Parking and Maximum Distance Requirements.**
10.18.070	**Requirements Applicable to Small Projects.**
10.18.080	**Enforcement.**
10.18.090	**Evaluation.**

Section 10.18.010 Purpose.

(a) It is the purpose of this Chapter to regulate and control atmospheric pollution from motor vehicles by formalizing parking and transportation demand management planning, programs, and coordination which have been ongoing for a number of years. This Chapter will reduce vehicle trips and traffic congestion within the City, thereby promoting public health, safety, and welfare and protecting the environment. This Chapter requires parking and transportation demand management (PTDM) plans for commercial parking facilities and other types of non-residential parking facilities over a specified size as set forth in 10.18.050 and 10.18.070. This Chapter also establishes a process whereby City officials will be able to track the number, use and location of off-street parking spaces in the City.

(b) A Parking and Transportation Demand Management Planning Officer will be designated by the City Manager with the responsibility for reviewing, conditioning, approving and/or denying PTDM plans. Any project subject to the requirements of this Chapter shall not be qualified to receive a permit from the Planning Board, a commercial parking permit from the Commercial Parking Control Committee, a special permit or variance from the Board of Zoning Appeal, a building permit from the Commissioner of Inspectional Services, a certificate of occupancy from the Commissioner of Inspectional Services, or an operating license from the License Commission absent written approval of its PTDM plan from the PTDM Planning Officer or evidence of registration of its parking spaces with the Department of Traffic, Parking, and Transportation.
(1211, Added, 11/16/1998)

Section 10.18.020 Definitions.

"Commercial Parking Space" means a parking space available for use by the general public at any time for a fee. The term shall not include (i) parking spaces which are owned or operated by a commercial entity whose primary business is other than the operation of parking facilities, for the exclusive use of its lessees, employees, patrons, customers, clients, patients, guests or residents but which are not available for use by the general public; (ii) parking spaces restricted for the use of the residents of a specific residential building or group of buildings; (iii) spaces located on public streets; or

(iv) spaces located at a park-and-ride facility operated in conjunction with the Massachusetts Bay Transportation Authority.

"Commercial Parking Facility" means a parking facility owned or operated by a commercial entity whose primary business is the operation of a parking facility and at which there are at least five (5) Commercial Parking Spaces.

"Commercial Parking Permit" means a (i) permit issued under chapter 10.16 of the Cambridge Municipal Code, authorizing the use of a designated number of parking spaces at a specified location as Commercial Parking Spaces; (ii) a permit or approval issued prior to the effective date of this Chapter pursuant to the Procedures, Criteria, and Memorandum of Agreement dated November 15, 1984; (iii) a Controlled Parking Facility Permit that expressly authorizes use of the parking facility for Commercial Parking Spaces; or (iv) a letter from the Director confirming the number of spaces at a specified location that were in existence and being used as Commercial Parking Spaces as of October 15, 1973.

"Controlled Parking Facility Permit" (CPFP) means a permit issued by the Director prior to the effective date of this Chapter, which authorized the construction or operation of a parking space or the construction, operation, or modification of a parking facility.

"Determination of Exclusion" means a determination made by the Director that a parking facility or a parking space did not require a controlled parking facility permit.

"Director" means Director of the Cambridge Department of Traffic, Parking, and Transportation.

"Effective Date" means November 16, 1998, the original date of final adoption of this Chapter of the Cambridge Municipal Code.

"Existing Parking Facility" shall mean a parking facility for which (i) a certificate of occupancy was issued by the Commissioner of Inspectional Services; (ii) an operating license was issued by the License Commission; or (iii) the Director issued a letter confirming the number of spaces at that location which spaces were in existence and being used as commercial parking spaces as of October 15, 1973 (a "Director's Letter").

"New Project" means a project to construct or operate parking spaces within a new facility or an existing parking facility which will cause such facility to have a net increase in the number of spaces for which a certificate of occupancy, operating license, variance, special permit, or Director's Letter has not been issued as of the effective date of this Chapter and which is not a park-and-ride facility operated in conjunction with the Massachusetts Bay Transportation Authority.

"Parking Facility" means any lot, garage, building or structure or combination or portion thereof, on or in which motor vehicles are parked, except any such facility used in association with or by a municipal police or fire station, and in the case of university or college campuses, the stock of parking spaces maintained within the City by the university or college which supports university or college activities within the City.

"Person" means and includes a corporation, firm, partnership, association, executor, administrator, guardian, trustee, agent, organization, any state, regional or political subdivision, agency, department, authority or board, and any other group acting as a unit, as well as a natural person.

"Planning Officer" means the City official responsible for PTDM plan reviews.

"PTDM" means Parking and Transportation Demand Management.

"Small Project" means a project to construct or operate five (5) to nineteen (19) non-commercial, non-residential parking spaces within a new facility or an existing parking facility which will cause such Facility to have a net increase in the number of spaces for which a certificate of occupancy, operating license, variance, special permit, or Director's Letter has not been issued as of the effective date of this Chapter. To qualify as a Small Project, the total number of non-commercial, non-residential parking spaces at the parking facility must remain at or below nineteen (19).
(1252, Amended, 09/24/2001; 1211, Added, 11/16/1998)

Section 10.18.030 PTDM Planning Officer.

Within thirty (30) days of the effective date of this Chapter, the City Manager shall designate a Parking and Transportation Demand Management Planning Officer who shall have responsibility for reviewing, conditioning, approving, and/or denying PTDM plans and who shall report to the City Manager. Said officer shall be a Cambridge resident within six months of employment in this position. Prior to rendering his/her determination(s), the Planning Officer shall consult with the PTDM plan applicant, the Director and the Assistant City Manager for Community Development.
(1211, Added, 11/16/1998)

Section 10.18.040 Registration of All Parking Spaces.

(a) No person shall build, expand, or reconfigure a parking facility for non-residential parking spaces resulting in a net increase in the number of parking spaces or a change in the use of such spaces based on the categories of use listed below at paragraphs b(v) and (vi), without first submitting a parking registration form to, and obtaining acceptance from, the Director.

(b) The registration form shall be prepared by the Director and shall be available at the offices of the Department of Traffic, Parking and Transportation. The form will require the following information:

(i) name and address of parking facility owner;

(ii) name and address of parking facility operator;

(iii) address of parking facility;

(iv) total number of existing parking spaces;

(v) number of existing parking spaces in each of the following categories:

- residential
- commercial
- non-commercial
- customer
- employee
- patient
- student
- client
- guest

(vi) number of parking spaces proposed to be added to the parking facility in each of the following categories:

- residential
- commercial
- non-commercial
- customer
- employee
- patient
- student
- client
- guest

(vii) identification of any existing parking permits for the parking facility; and

(viii) explanation of any enforcement actions against the parking facility.

(c) The Director shall accept or return a registration form to the registrant with a request for additional information within thirty (30) days after the form was filed.

(d) The License Commission shall not issue a license and the Commissioner of Inspectional Services shall not issue a building permit or certificate of occupancy for a parking facility subject to this section without evidence (i) that the registration form has been accepted by the Director; and (ii) if required, that the facility has a PTDM Plan approved by the Planning Officer.
(1252, Amended, 09/24/2001; 1211, Added, 11/16/1998)

Section 10.18.050 Parking and Transportation Demand Management Plans.

(a) No person shall build, expand, or operate a parking facility subject to the Parking and Transportation Demand Management (PTDM) Plan requirements of this Chapter absent a PTDM Plan approved by the Planning Officer.

(b) The PTDM requirements of this Chapter shall apply to each of the following:

(i) any commercial parking facility for which a certificate of occupancy or operating license, variance or special permit was not obtained prior to the effective date of this chapter;

(ii) an existing commercial parking facility at which the number of parking spaces is increased after the effective date of this chapter;

(iii) any parking facility at which the use of existing or permitted parking spaces is changed to commercial use after the effective date of this chapter;

(iv) any new project to build or create by change of use twenty or more non-residential parking spaces; and

(v) any new project to expand an existing parking facility resulting in a total number of non-residential parking spaces of twenty (20) or more.

(c) The PTDM Plan shall be designed to minimize the amount of parking demand associated with the project and reduce single-occupant vehicle trips in and around Cambridge. The PTDM Plan shall be based on the following facts, projections and commitments:

(i) Facts and Projections:

- nature of development and property use;
- proximity of project to public transit and other non-Single-Occupant Vehicle facilities;
- availability of and accessibility to offsite parking spaces which could serve the project;
- number of employees and their likely place of origin; and
- type and number of patrons/users of proposed parking supply and their likely place of origin.
- number of vehicle trips expected to be generated by the project and description of measures to reduce associated traffic impacts on Cambridge streets; and
- other factors published by the Planning Officer.

(ii) Commitments:

- commitment to work with the Cambridge Office of Work Force Development;

- commitment to implement vehicle trip reduction measures including some or all of the following:

subsidized MBTA passes and other incentives; shuttle services; ride-sharing services; bicycle and pedestrian facilities; flexible working hours; preferential parking for Low Emission Vehicles/Zero Emission Vehicles/bicycles/carpools/vanpools (Note: this list is not meant to preclude implementation of other types of vehicle trip reduction measures). This commitment must be accompanied by a detailed description of the measures proposed to be implemented; and

commitment to establish and make reasonable efforts to achieve a specified, numeric reduction (or percent reduction) in single-occupant vehicle trips in and around Cambridge. The percent reduction will be based on PTDM practices successfully implemented in reasonably comparable environments and as identified in professional and academic literature and based on analysis of existing trip reduction measures in Cambridge.

Each PTDM Plan shall identify the total number of existing and proposed parking spaces at the facility and specify how many existing and proposed spaces fall within each of the following categories (explain how many spaces are used for multiple purposes):

- residential
- commercial
- non-commercial
- customer
- employee
- patient
- student
- client
- guest

Where the parking facility includes or proposes a combination of commercial and non-commercial parking spaces, the Plan shall specify how the parking facility will prevent commercial use of the non-commercial parking spaces.

Each PTDM Plan shall contain the following certification signed by an authorized corporate officer:
"I hereby certify that a commercial parking permit has been obtained for each space being used for commercial parking. None of the other existing or proposed parking spaces at this parking facility have been or will be available as commercial parking spaces until a commercial parking permit therefor has been obtained."

(d) The Planning Officer shall review, condition, approve and/or deny the PTDM Plan based on the above-listed facts, projections, and commitments. The Planning Officer shall issue his/her decision in writing within 60 days of receipt of the proposed PTDM Plan. The required time limit for action by the Planning Officer may be extended by written agreement between the proponent and the Planning Officer. Failure by the Planning Officer to take final action within said sixty (60) days or extended time, if applicable, shall be deemed to be approval of the proposed PTDM plan. If the project proponent elects to make a request pursuant to 10.18.060, the decision of the Planning Officer shall be expanded to include a recommendation about whether off-site parking should be allowed at distances greater than those allowed in the Zoning Ordinance and/or whether fewer parking spaces than the minimum required in the Zoning Ordinance should be allowed. Decisions of the Planning Officer may be appealed by the project proponent to a review

committee composed of the City Manager, or his designee, and two other City staff members designated by the City Manager none of whom may have participated in the initial review of the Plan.

(e) The Planning Officer shall also make available sample PTDM plans which a project proponent may adapt for their project, such to approval by the Planning Officer.

(f) No permit, commercial parking permit, special permit, variance, building permit, certificate of occupancy, or operating license shall be issued for any project subject to 10.18.050 by the Planning Board, Commercial Parking Control Committee, Board of Zoning Appeal, Commissioner of Inspectional Services, or License Commission absent a written decision indicating approval from the Planning Officer of the project proponent's PTDM Plan. Any such permit or license shall be consistent with, and may incorporate as a condition, the decision of the Planning Officer and shall include written notice of the requirements of 10.18.050 (g) and (h), below. Nothing in this ordinance shall be construed to limit the power of the Planning Board or Board of Zoning Appeal to grant variances from or special permits under the provisions of the Zoning Ordinance. No project proponent shall be required by the Planning Officer to seek such relief under the Cambridge Zoning Ordinance.

(g) Approvals issued by the Planning Officer shall be automatically transferrable by and among private parties, provided that the proposed new owner (the "Transferee") shall continue to operate under the existing PTDM Plan and shall submit to the Planning Officer within thirty (30) days of the title transfer a certification that the existing PTDM plan will remain in effect. The certification shall be submitted on a form issued by the Planning Officer and shall certify that such Transferee commits to implement the existing PTDM plan, as approved; and acknowledges that failure to implement the plan is subject to the enforcement provisions of this Chapter. Where such certification is submitted, the approved plan shall remain in effect as to the Transferee. The Transferee may elect instead to and consult with the Planning Officer within thirty (30) days of title transfer regarding appropriate revisions to the existing plan. Based on such consultation, the Planning Officer may require information from the Transferee concerning proposed changes in use of the parking facility and associated buildings and the relevant facts and projections regarding the proposed changes. Within thirty (30) days of receipt of such information, the Planning Officer may issue a written approval of the revised plan and obligations to the Transferee, or the Planning Officer may require submittal of a new PTDM Plan from the Transferee for review, condition, approval and/or denial. Until such time as a new or revised plan has been approved, the existing PTDM plan shall remain in effect.

(h) Each PTDM Plan approval issued by the Planning Officer shall contain, at a minimum, the following conditions:

(i) The parking facility owner and operator each commit to implement all elements of the PTDM Plan, as approved, including annual reporting requirements, and to maintain records describing implementation of the Plan;

(ii) The City shall have the right to inspect the parking facility and audit PTDM implementation records; and

(iii) The parking facility owner and operator each commit to notify and consult

with the Planning Officer thirty (30) days prior to any change in ownership, use or operation of the facility.
(1252, Amended, 09/24/2001; 1211, Added, 11/16/1998)

Section 10.18.060 Reduction in Minimum Parking and Maximum Distance Requirements.

(a) A project proponent may elect to request that the Planning Officer include as an element of its PTDM Plan a plan for fewer parking spaces that the minimum set forth in the Zoning Ordinance. Upon the written request of the project proponent, based on an evaluation of the facts, projections, and commitments listed at 10.18.050 (c), the Planning Officer may make a written recommendation about the maximum number of parking spaces for the project. This recommendation shall remain subject to review and approval by the Planning Board or Board of Zoning Appeal as appropriate.

(b) A project proponent may elect to request that the Planning Officer include as an element of its PTDM Plan a plan for utilizing off-site parking spaces that are farther from the project site than the maximum distance requirements set forth in the Zoning Ordinance. Upon the written request of the project proponent, based on an evaluation of the facts, projections, and commitments listed at 10.18.050 (c), the Planning Officer may make a written recommendation about how many parking spaces serving the project may be appropriately located at an off-site location and at what distance from the project site. This recommendation shall remain subject to review and approval by the Planning Board or Board of Zoning Appeal as appropriate.
(1211, Added, 11/16/1998)

Section 10.18.070 Requirements Applicable to Small Projects.

The owner or operator of each Small Project shall implement at least three (3) PTDM measures and maintain records of such implementation. A list of acceptable types of measures may be obtained from the Traffic, Parking and Transportation Department, the Inspectional Services Department, the Community Development Department, or the License Commission. The Planning Officer shall create and periodically update this list, which shall include: T-pass subsidies; bicycle parking; changing facilities; carpools/vanpools; financial incentives not to drive alone; or other similar measures.
(1252, Amended, 09/24/2001; 1121, Added, 11/16/1998)

Section 10.18.080 Enforcement.

(a) The Director shall enforce the provisions of this Chapter. If the Director has reason to believe that any provision of this Chapter is being violated, the Director shall investigate the possible violation. If after investigation the Director determines that any provision of this Chapter is being violated, s/he shall provide a first written notice of violation to the person charged with the violation, or the duly authorized representative thereof, of the determination of violation and shall order that the violation cease within thirty (30) days of the issuance of the first written notice. If the violation is not cured within the thirty (30) days after issuance of the determination of violation, the Director may proceed to assess the fines es-

tablished in this chapter as well as any other remedies available to the city. In addition to all other remedies, if the violation has not ceased within thirty (30) days after the first written notice, then the Director may order shutdown of the parking facility. Second or subsequent written notices to a facility for the same violation shall be immediately effective and shall not provide the thirty (30) day opportunity to cure contained in the first written notice. A determination and order of the Director may be appealed to the City Manager by the person charged with the violation within thirty (30) days of issuance of the Director's determination and order.

(b) In addition to other remedies available to the City, any person who builds or modifies a parking facility without complying with the provisions of this Chapter shall be subject to a fine of up to $10.00 per day per parking space for every day that such parking space was operated without a registration accepted by the Director or without a PTDM Plan approval issued by the Planning Officer or in non-compliance with an approved PTDM Plan. On a determination, after investigation, by the Director that this Chapter is being violated, and the exhaustion of any appeal to the City Manager in accordance with (a) above, the Director shall take steps to enforce this chapter by causing complaint to be made before the district court and/or by applying for an injunction in the superior court.

(c) In addition to other remedies available to the City, a determination that a facility is operating in violation of the provisions of this Chapter shall be ground for revocation by the Director of the facility's parking permit or other form of approval.

(d) The Planning Officer shall have independent authority to inspect a parking facility and audit its records to determine whether it is in compliance with its PTDM Plan. The Planning Officer shall issue a finding of non-compliance in writing and provide copies to the parking facility owner and operator and to the Director.
(1211, Added, 11/16/1998)

Section 10.18.090 Evaluation.

The PTDM Planning Officer shall prepare a report annually on the status and effectiveness of the implementation of this Ordinance.
(1300, Amended, 09/11/2006; 1252, Amended, 09/24/2001; 1211, Added, 11/16/1998)

APPENDIX B: CAMBRIDGE COMMUNITY SURVEY SUMMARY

Cambridge Bicycle Survey Summary

October, 2014

This is an overview of the key results from a survey administered as part of the Cambridge Bicycle Network Plan public outreach.

Conclusion: Although most people who responded to the on-line survey about bicycling in Cambridge ride frequently and extensively, they report that they are not comfortable on many streets and would like to see more protected bicycle facilities and bicycle-friendly street designs.

Survey Background

As part of creating a new Bicycle Master Plan for Cambridge, an on-line survey was administered during June, 2014. The survey was open to anyone, and although outreach about the survey was sent broadly throughout the community, most of the survey participants were regular cyclists, and thus not representative of the population of Cambridge, or of greater Boston. 733 responses were received.

The survey was designed to determine what kind of bicycle facilities are most comfortable for users and what will enable parents and guardians to feel that their kids can bike safely in the City. Survey questions focused on:

- Bicycling habits
- Comfort with bicycling on different streets and various bicycle facility types
- Children's bicycling habits and parents/guardians' comfort allowing children to ride on different streets/facility types

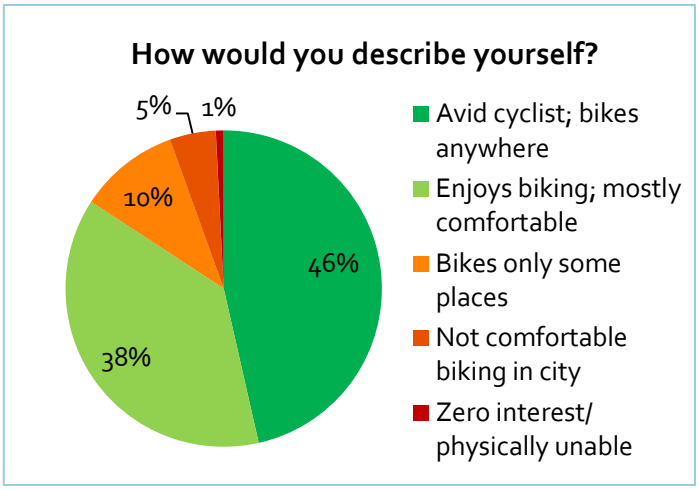
Who Responded to the Survey?

- The majority of respondents (53%) were female
- The majority of respondents were between 25-44 years old. Only 7% were in the 18-24 year old population; this would seem an underrepresentation of the student/young adult population who live and bicycle in Cambridge. This may be because the survey was administered in June, when area schools are out for the summer, although approximately 12% identified themselves as full or part-time students

- Approximately half the respondents are Cambridge residents, with another 35% living in the abutting communities
- 89% identified themselves as white/Caucasian, not representative of the general population in Cambridge
- 28% of respondents have children under age 18 at home

Bicycling Habits of Respondents

- The plurality of respondents consider themselves avid cyclists who bike everywhere, followed closely by people who are enthusiastic cyclists who prefer to ride on main streets with bike lanes or on minor streets with traffic calming/ low traffic speeds/ residential streets. About 15% limit their riding to off-road paths or out of the city.
- The vast majority of respondents ride several days a week outside of winter
- The majority of respondents ride at least sometimes during the winter and almost a quarter continue to ride daily.

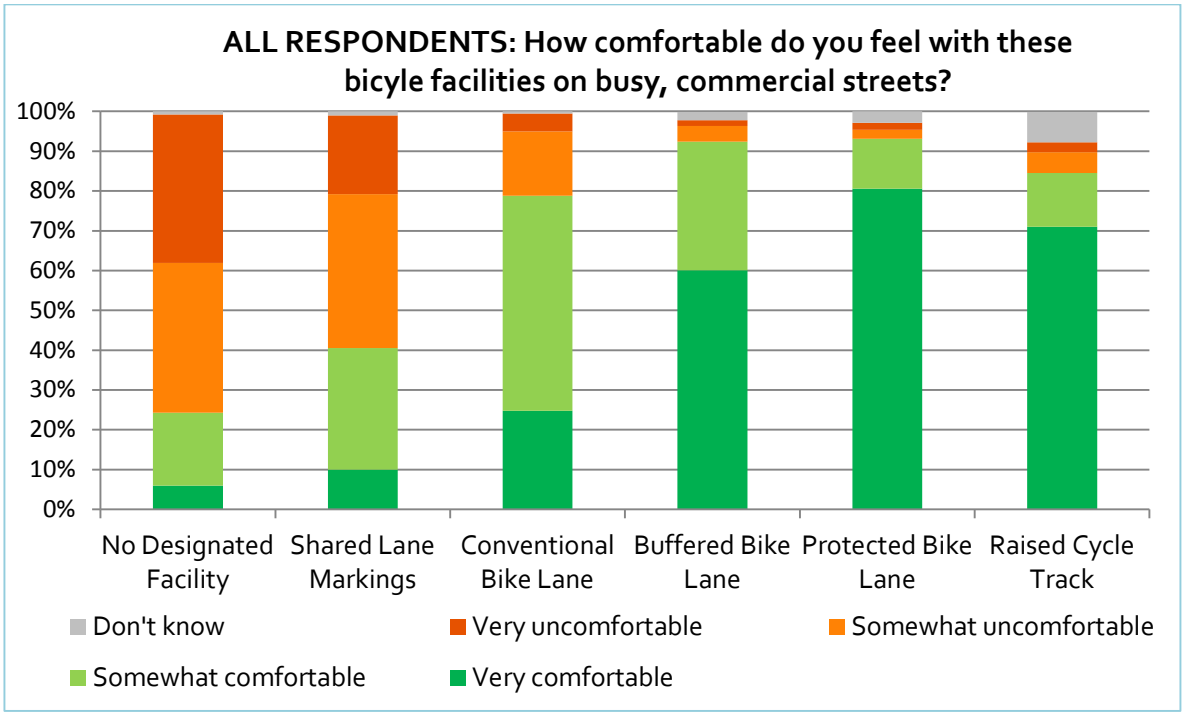


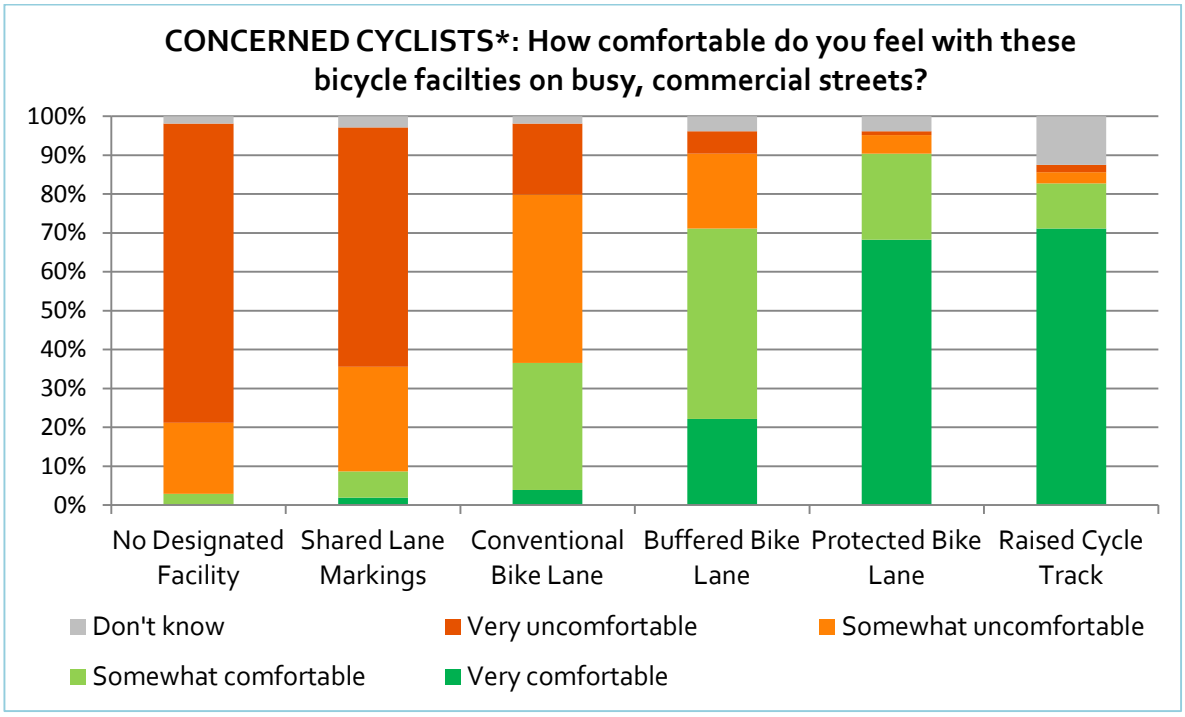
Bicyclist Comfort Levels

Cyclists were asked about their comfort levels cycling on a variety of accommodations. People were asked about their comfort levels on busy commercial streets and on non-commercial streets and sample photographs were shown for each condition.

People were also asked a separate series of questions about bicycling with children, including similar questions about comfort levels on various road types and bicycle accommodations.

Bicycling Comfort on Busy, Commercial Streets





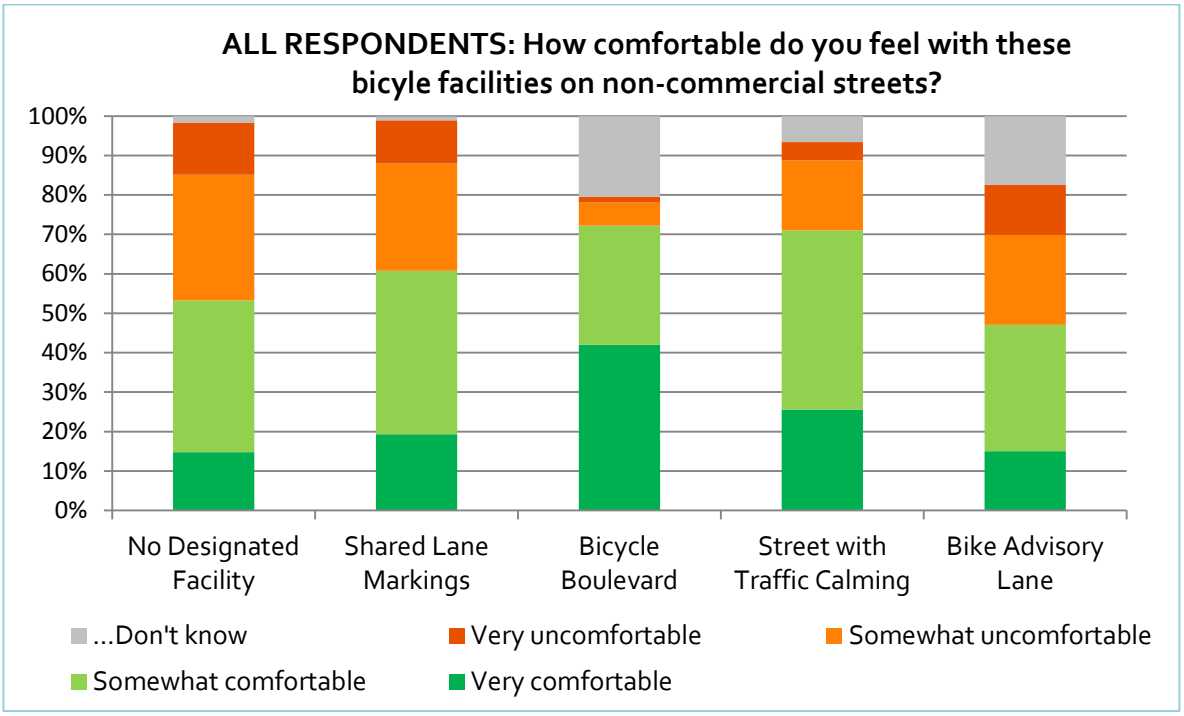
*Concerned cyclists are defined as survey respondents who reported that they bike only some places or are not comfortable biking in the city.

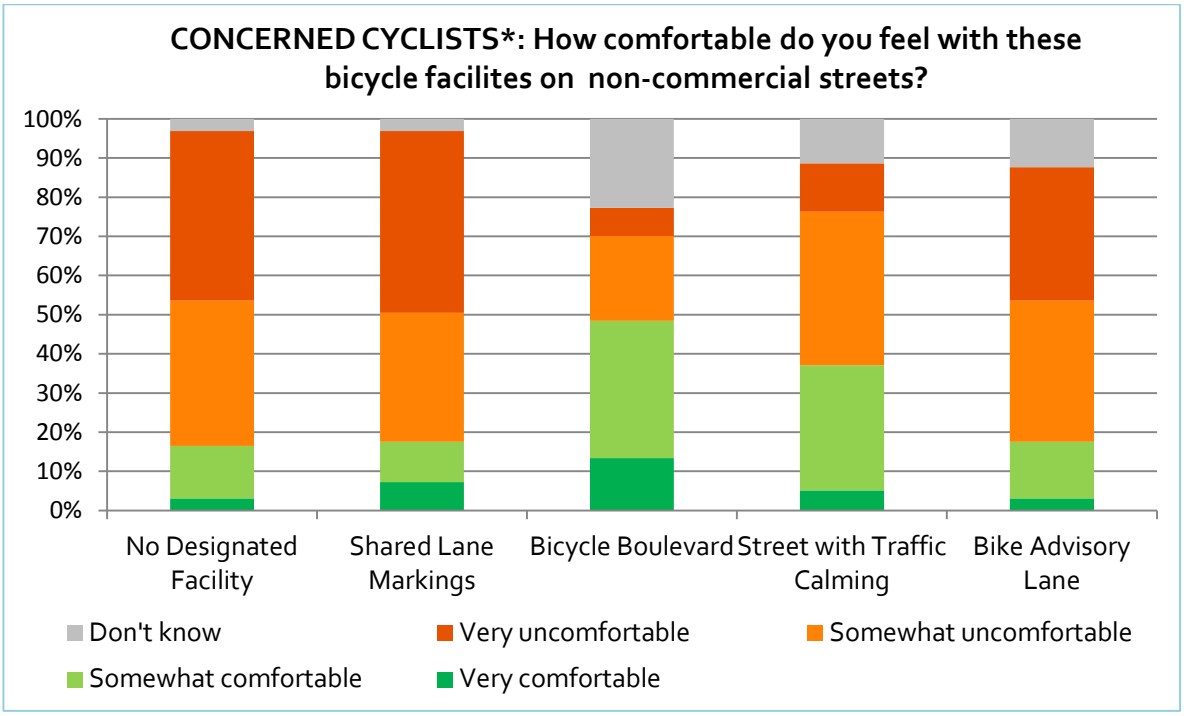
Photos of Bicycle Facilities on Busy, Commercial Streets

Street with Shared Lane Markings 	Street with Shared Lane Markings
Conventional Bike Lane 	Conventional Bike Lane
Buffered Bike Lane 	Buffered Bike Lane

Protected Bike Lane 	Protected Bike Lane
Raised Cycle Track 	Raised Cycle Track
No designated facility 	No designated facility

Bicycling Comfort on Non-Commercial Streets



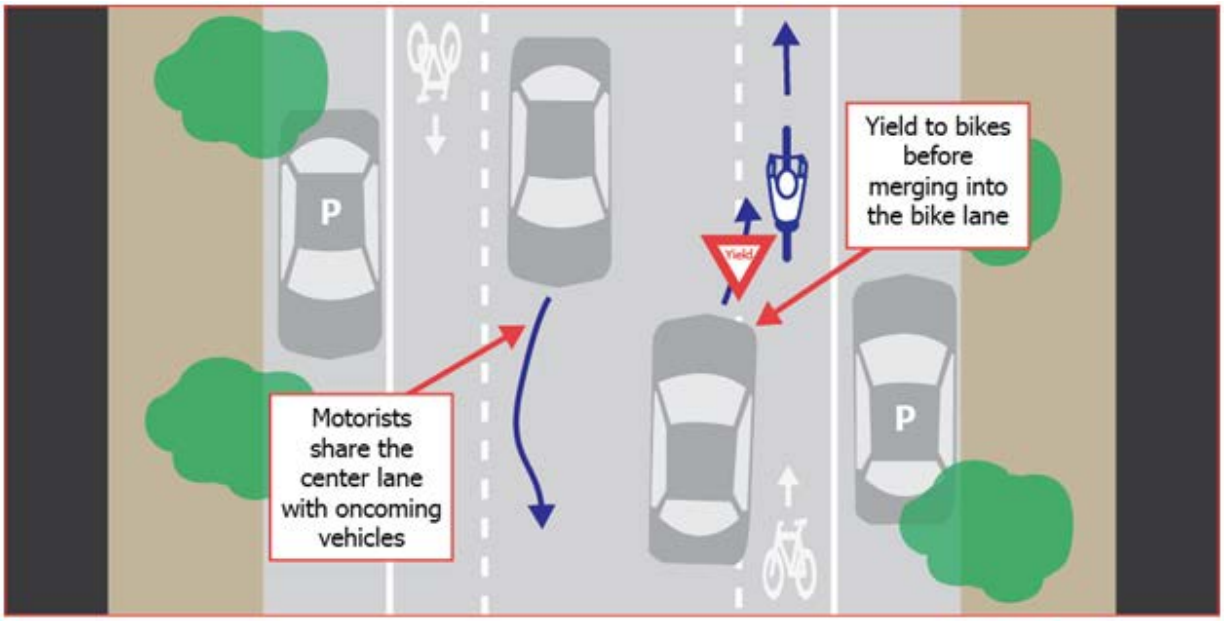


*Concerned cyclists are defined as survey respondents who reported that they bike only some places or are not comfortable biking in the city.

Photos of Bicycle Facilities on Non-Commercial Streets

Street with Shared Lane Markings 	Street with Shared Lane Markings
Bicycle Boulevard 	Bicycle Boulevard
Street with Traffic Calming 	Street with Traffic Calming

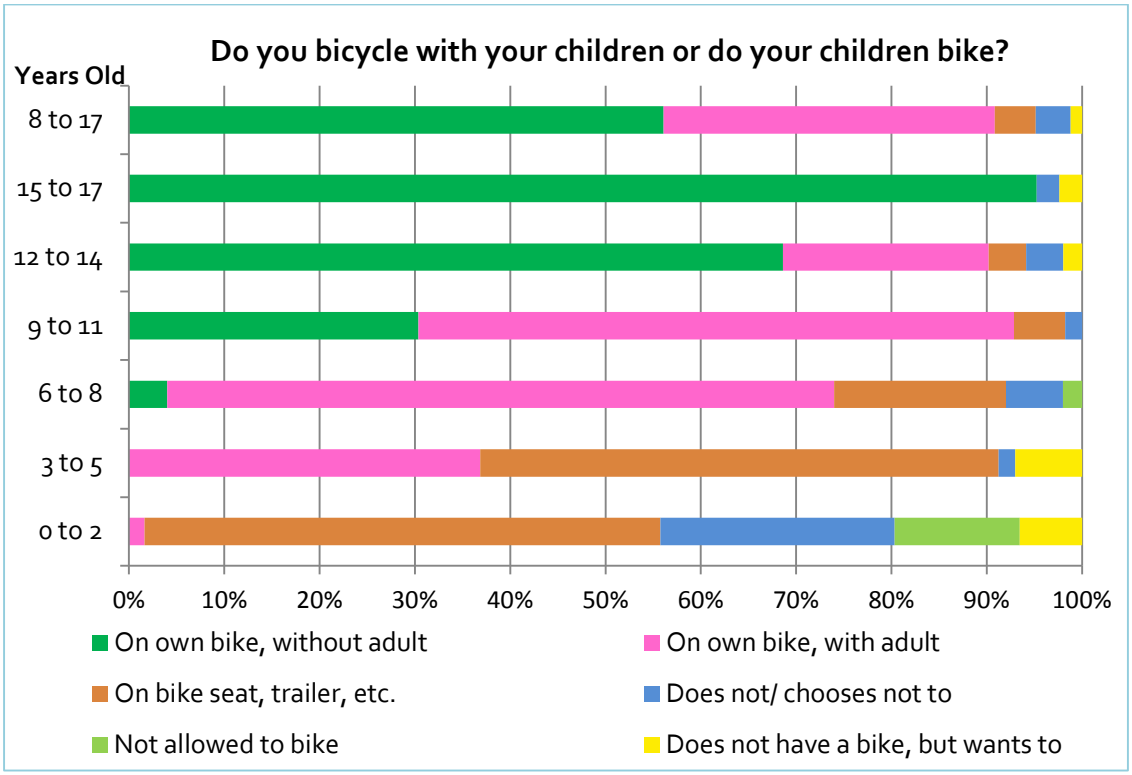
Bicycle Advisory Lanes

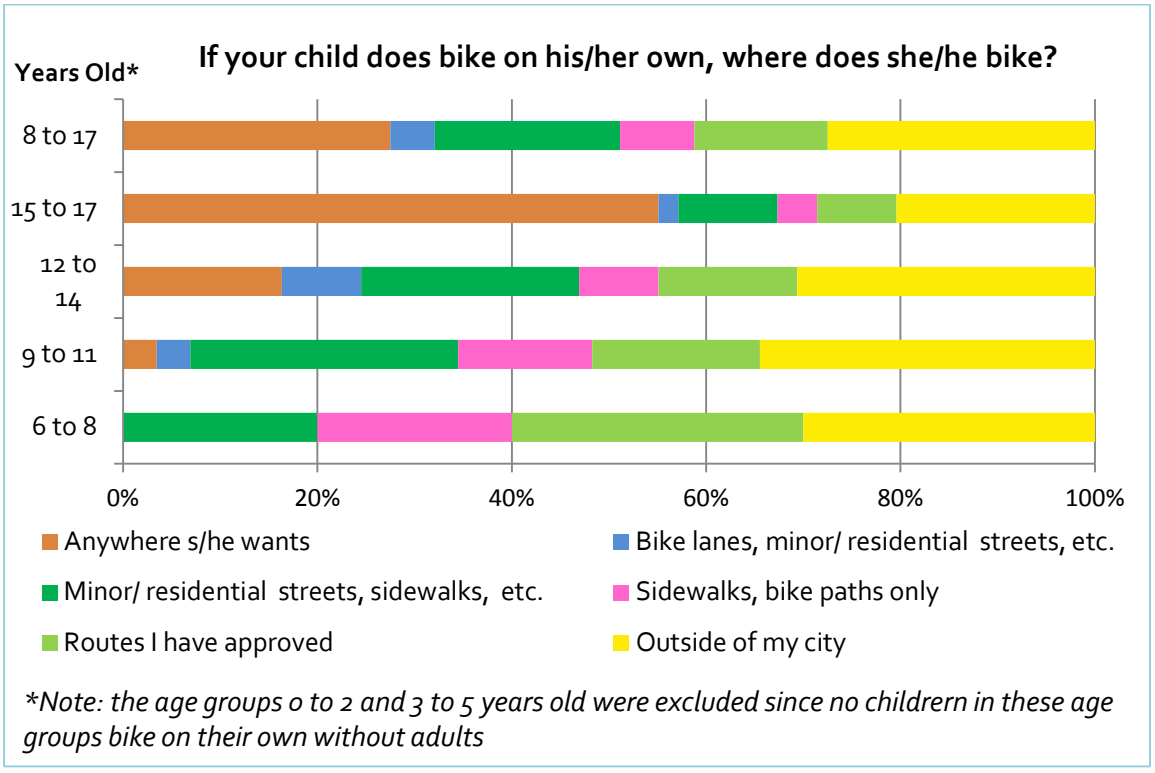


Bicycle Advisory Lanes

No designated facility

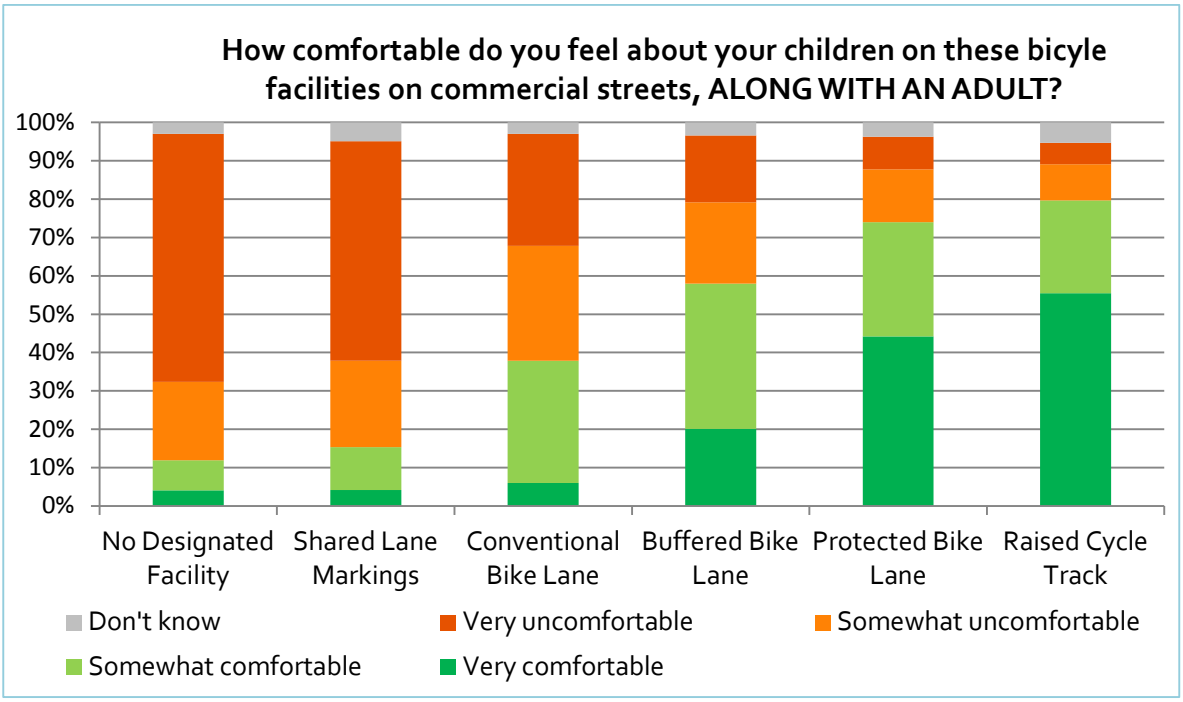
Questions about Bicycling with Children

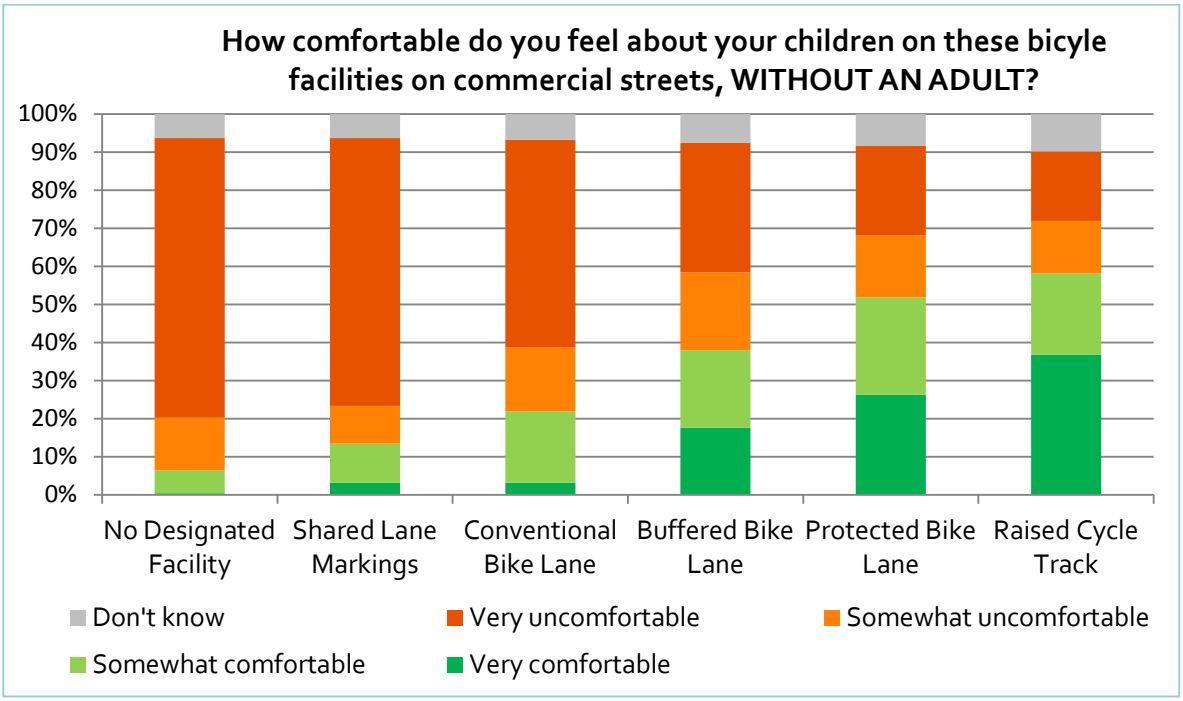




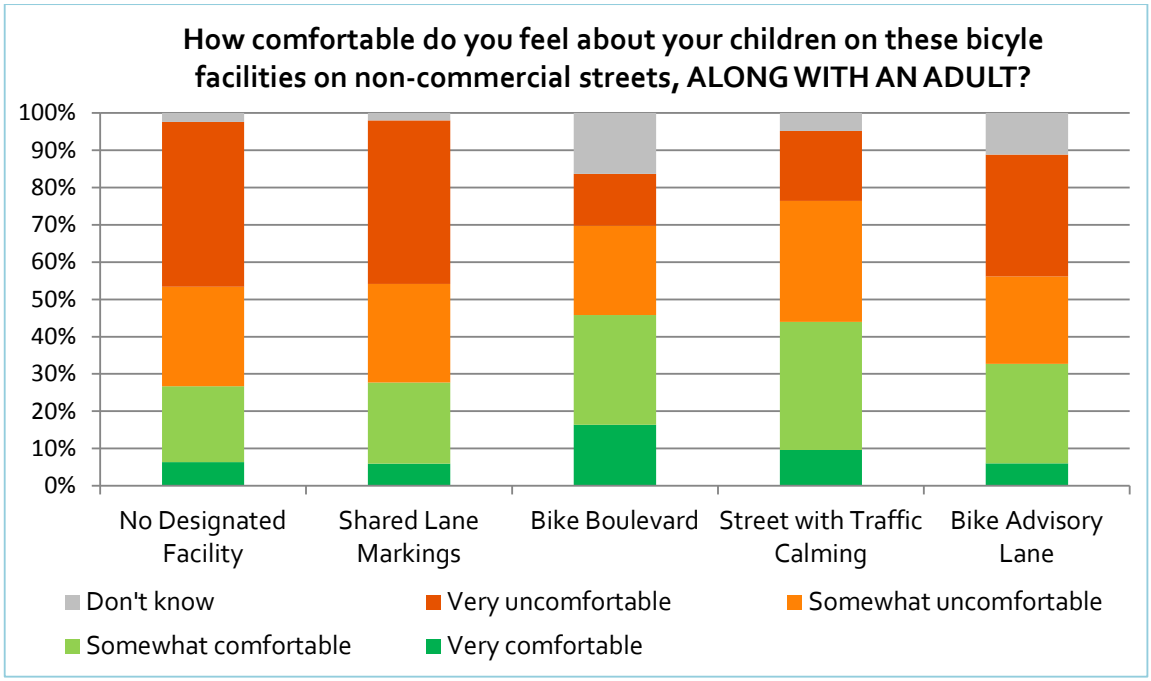
**Note: the age groups 0 to 2 and 3 to 5 years old were excluded since no childrern in these age groups bike on their own without adults*

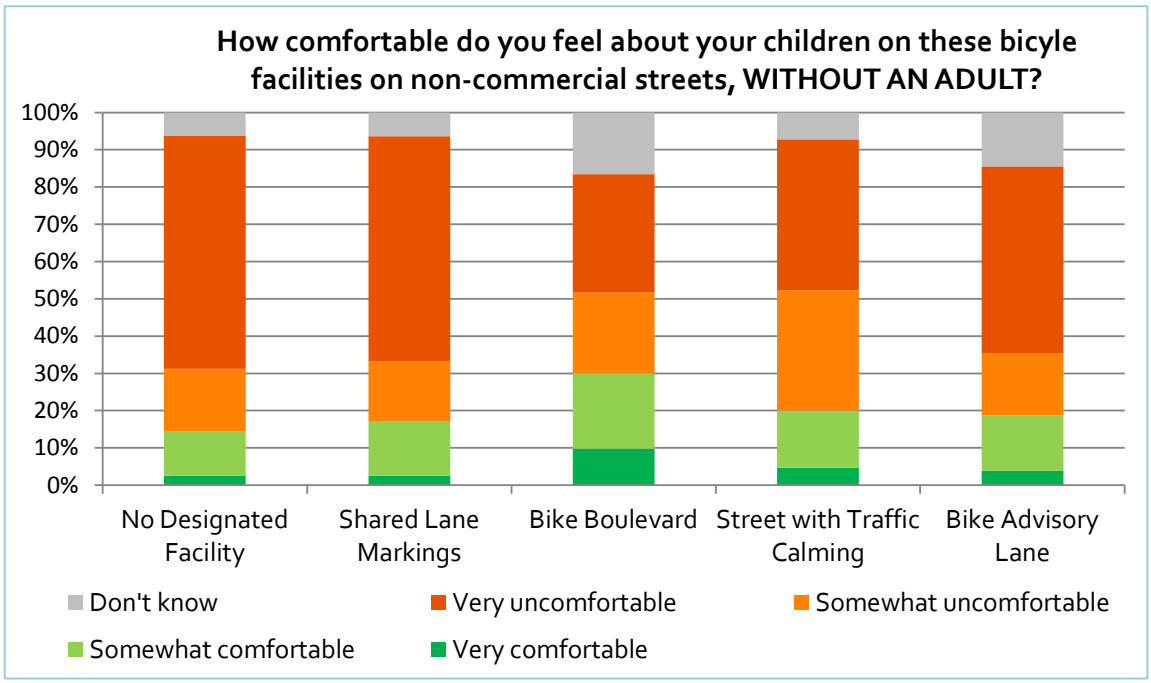
Bicycling Comfort on Busy, Commercial Streets - Children





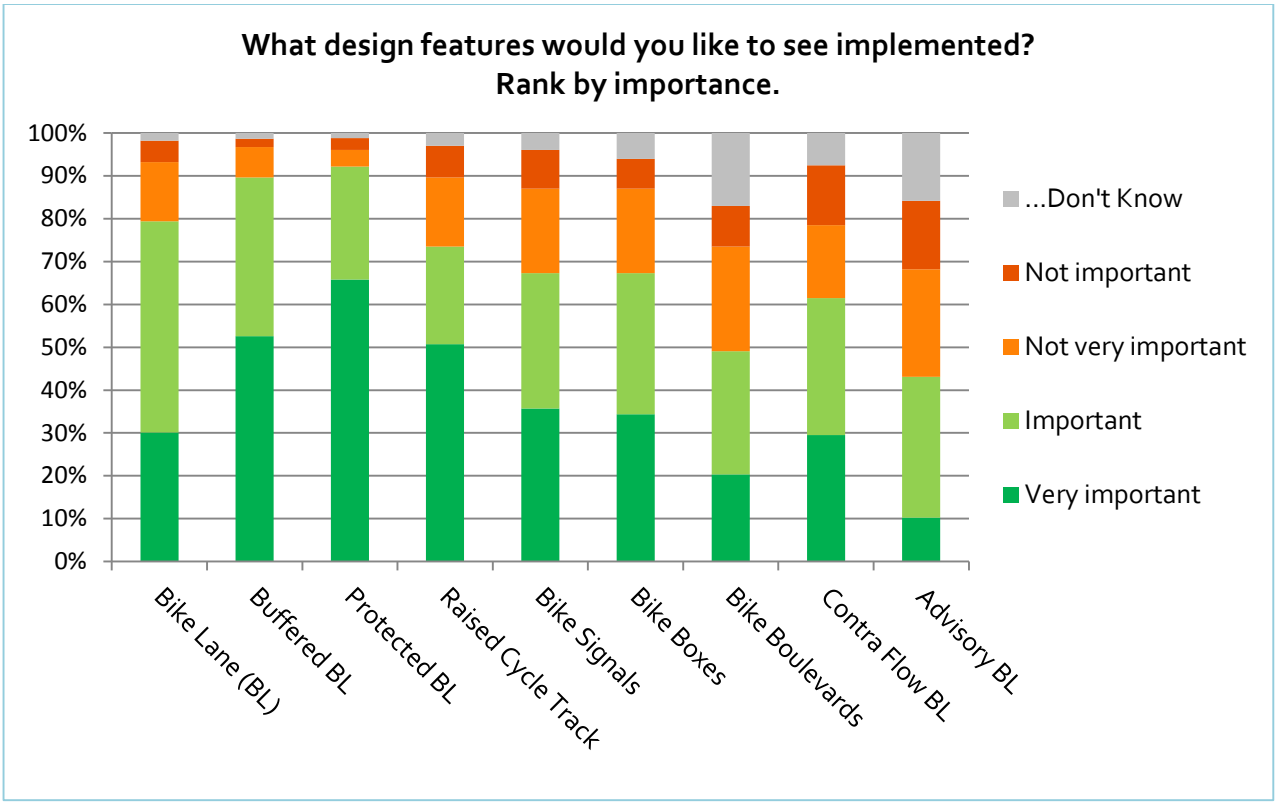
Bicycling Comfort on Non-Commercial Streets - Children





Preferred Bicycle Facilities

Survey respondents were asked to rate the importance of various bicycle facility options that they would like to see implemented in Cambridge.



Photos of Bicycle Design Features

Conventional Bike Lane

Buffered Bike Lane

Protected Bike Lane

Raised Cycle Track

Bicycle Traffic Signals

Bike Boxes

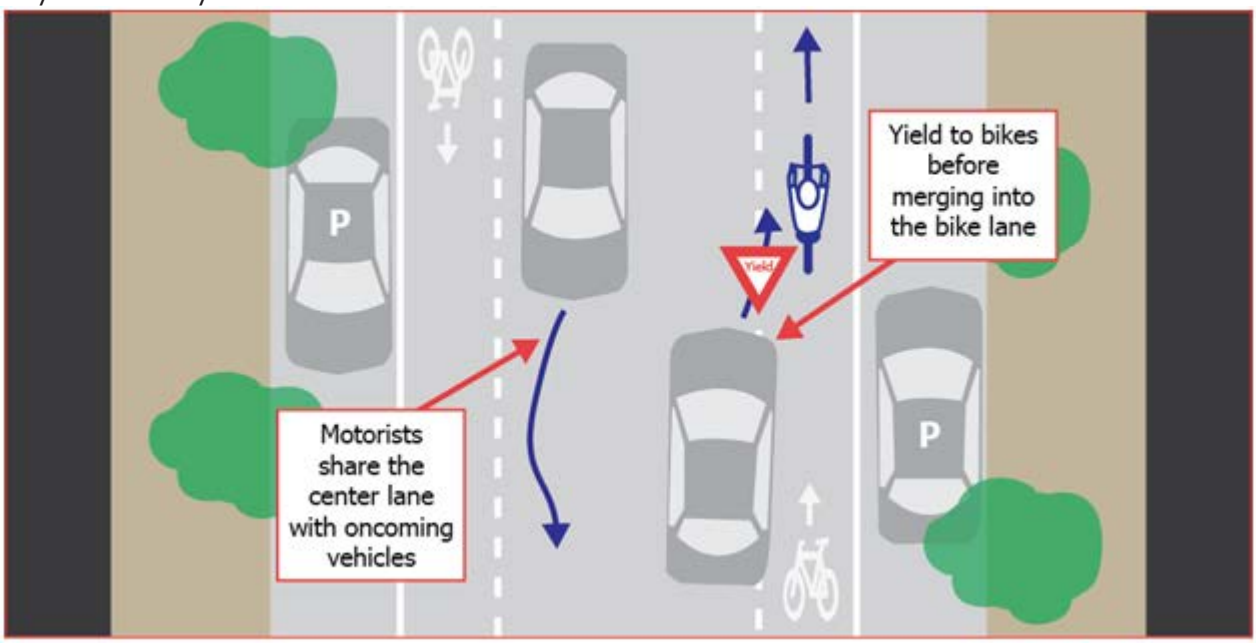
Bicycle Boulevard

Bicycle Boulevard

Contra-Flow Bike Lanes

Bicycle Advisory Lanes

Bicycle Advisory Lanes



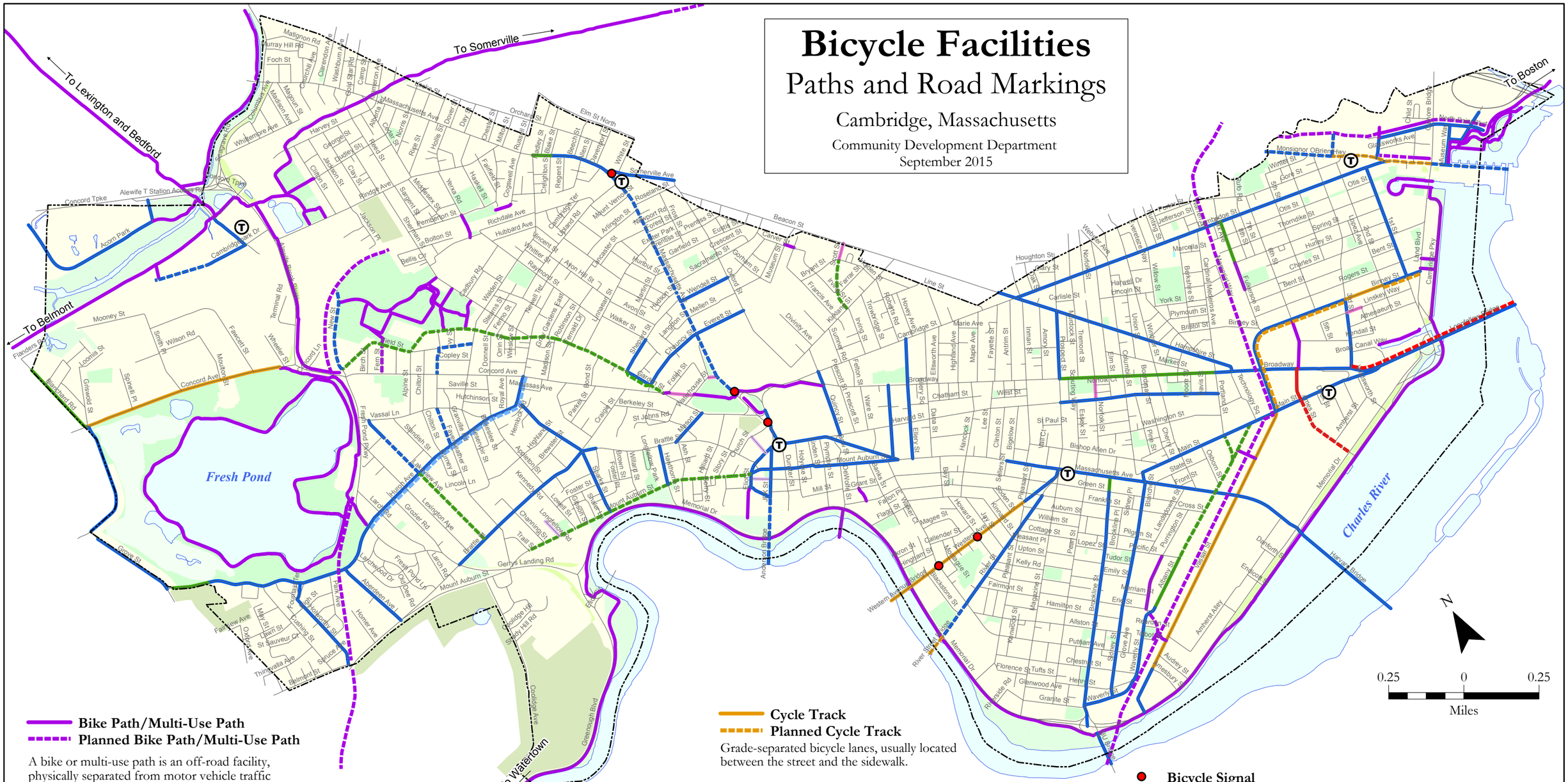
APPENDIX C: EXISTING BICYCLE FACILITIES MAP

Bicycle Facilities

Paths and Road Markings

Cambridge, Massachusetts

Community Development Department
September 2015



Bike Path/Multi-Use Path
Planned Bike Path/Multi-Use Path

A bike or multi-use path is an off-road facility, physically separated from motor vehicle traffic by an open space or barrier.

Bike Lane
Planned Bike Lane

A lane on a street restricted to bicycles and designated by means of painted lines, pavement coloring, bicycle symbols, or other appropriate markings.

Planned Buffered Bike Lane

A bike lane on a street that is separated from the parking lane by open space that is indicated by pavement markings.

Protected Bike Lane
Planned Protected Bike Lane

A bike lane at street level with physical protection from passing motor vehicle traffic, such as a parking lane or other barrier. Sometimes referred to as an at-grade cycle track.

Contra-flow

A contra-flow lane is a bicycle facility marked to allow bicyclists to travel against the flow of traffic on a one-way street.

Cycle Track
Planned Cycle Track

Grade-separated bicycle lanes, usually located between the street and the sidewalk.

Shared Lane Pavement Marking
Planned Shared Lane Pavement Marking

A bicycle symbol marked on the pavement intended to remind motorists that bicyclists share the road. Used when there is insufficient space for bicycle lanes and specific bicycle markings are desired.

Shared Street

A street that is created as a common space to be shared by pedestrians, bicyclists, and low speed motor vehicles, all at the same level without grade-separated sidewalks.

Bicycle Signal

A traffic signal for bikes that provides cyclists with their own signal phase, enabling them to more safely and conveniently cross intersections.

This map is for planning purposes and is subject to change. It is not a route map. Bicycles are encouraged to use all streets within the city. Updated versions of this map will be posted on the city website.

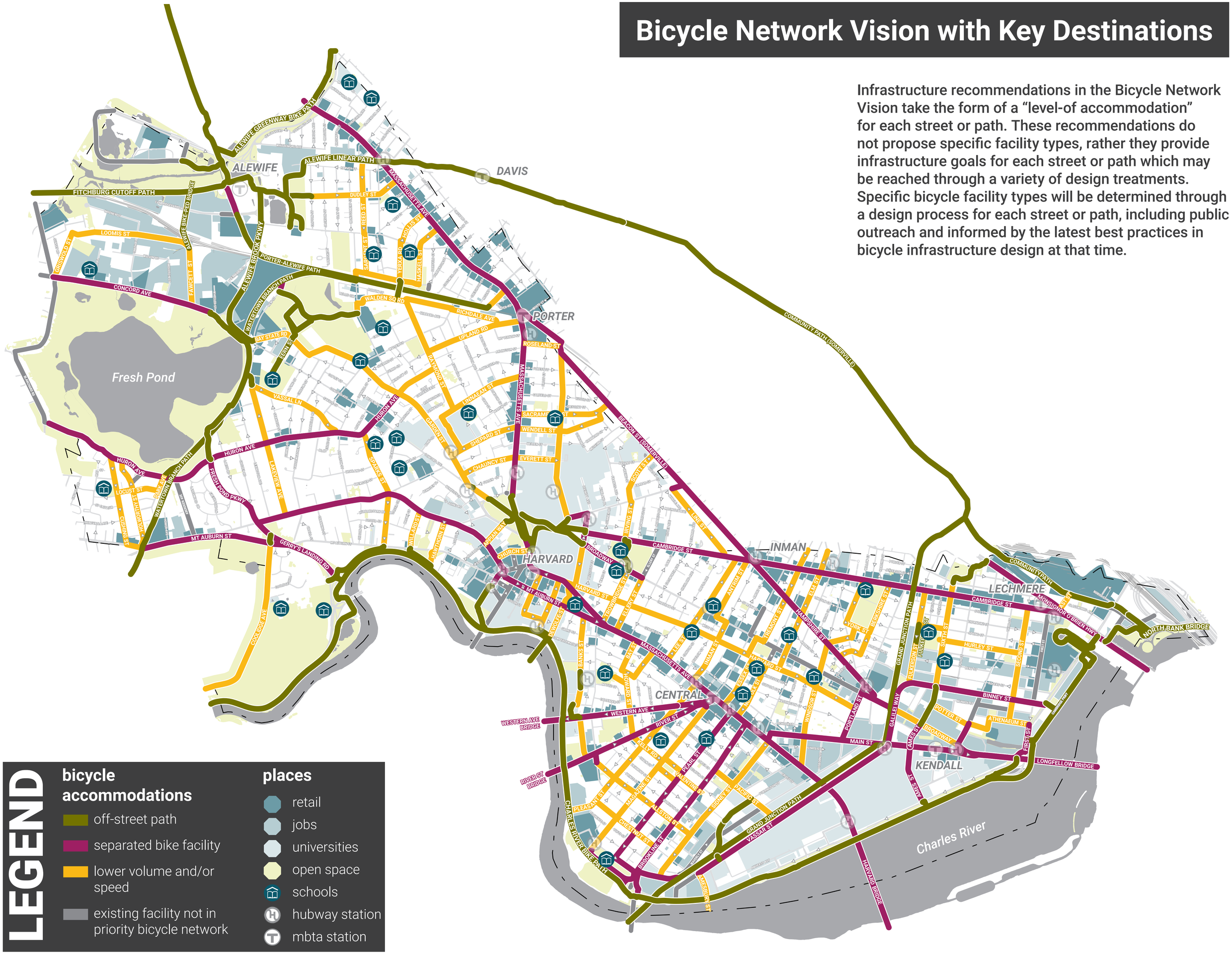
For more information on city bike programs, go to:
www.cambridgema.gov/home/CDD/Transportation/gettingaroundcambridge/bybike.aspx

Map prepared by Brendan Monroe on June 30, 2015. CDD GIS C:\Projects\BikePaths\Facilities11x17.mxd

APPENDIX D: BICYCLE NETWORK VISION MAP

Bicycle Network Vision with Key Destinations

Infrastructure recommendations in the Bicycle Network Vision take the form of a “level-of accommodation” for each street or path. These recommendations do not propose specific facility types, rather they provide infrastructure goals for each street or path which may be reached through a variety of design treatments. Specific bicycle facility types will be determined through a design process for each street or path, including public outreach and informed by the latest best practices in bicycle infrastructure design at that time.



LEGEND

bicycle accommodations

- off-street path
- separated bike facility
- lower volume and/or speed
- existing facility not in priority bicycle network

places

- retail
- jobs
- universities
- open space
- schools
- hubway station
- mbta station

APPENDIX E: BICYCLE LEVEL OF COMFORT CRITERIA

In addition to the level of traffic stress factors based on the Mineta Institute Study*, the Cambridge Bicycle Level of Comfort Analysis includes the additional factors below to account for context specific traffic stress.

Mixed Traffic Stress

BLC	1	2	3	4	5
ADT	<2k	2K - 4K	4K - 6K	6K - 15K	15K+, 4+ travel lanes total, no on-street parking, speed ≥ 30mph

Operating Space Stress

BLC	1	2	3	4	5
ADT	no effect	<2K	2K - 4K	no effect	no effect

Applies to streets with the following conditions:

Parking: Both sides
Travel Lanes: One
Direction: One-way
Bike Facility: Mixed Traffic

Bus Frequency Stress

BLC	1	2	3	4	5
Bus Frequency	no effect	no effect	Bus frequency greater than citywide average (7 Buses per hour)	Bus frequency greater than citywide average (7 Buses per hour) AND bus stop within 100 ft. of road segment	no effect

*Mekuria, M., Furth, P., and Nixon, H., Low-stress bicycling and network connectivity, Mineta Transportation Institute (2012).

APPENDIX F: BICYCLE PARKING GUIDE

City of Cambridge

Bicycle Parking Guide

WHY IS BICYCLE PARKING IMPORTANT?

The City of Cambridge promotes bicycling as a healthy, environmentally friendly way of getting around. Cambridge is well suited for bicycling and more people are using their bikes every day for commuting, shopping, and general transportation. Enhancing and promoting sustainable transportation is a cornerstone of Cambridge's policies.

Providing bicycle parking encourages people to use their bicycles as transportation. People are more likely to use a bicycle if they are confident that they will find convenient and secure parking at their destination.

photo by Jessica Zdeb

Providing a designated area for bicycle parking gives a more orderly appearance to a building and prevents cyclists from locking their bikes to unacceptable fixtures, such as trees, benches, or railings. However, if a bicycle rack appears insecure, does not fit bicycles well, or is in the wrong location, cyclists will not use it. Ensure that your bicycle racks are approved and well used by following these guidelines.

DEVELOPMENT REQUIREMENTS AND ZONING ORDINANCE

Locations and types of bicycle parking must be shown in building site plans at a 1:10 scale and be approved by the Traffic, Parking, and Transportation Department and the Community Development Department. Zoning requirements are found in Article 6.100 of the Zoning Ordinance. This brochure provides an overview of the requirements with some details and graphics for clarification, but it should not be construed as the full set of legal requirements. Please refer to the full text of the zoning ordinance here:

www.cambridgema.gov/CDD/zoninganddevelopment/

WHAT IS A BICYCLE PARKING SPACE?

A bike parking space is an area within which one intact bicycle may be easily and conveniently accessed and securely stored and removed in an upright position with both wheels resting on a stable surface, without requiring the movement of other parked bicycles, vehicles, or their objects to access the space.

HOW MUCH BICYCLE PARKING IS REQUIRED BY ZONING?

The tables below summarize the zoning requirements for some typical land uses. For more detail, review Section 6.100 of the Zoning Ordinance. When calculating the required number of long-term or short-term bicycle parking spaces for a particular use, round up to the nearest whole number.

	Minimum Required Bicycle Parking (see pg. 7 for more details)	
Residential Use Type	**Long-Term**	**Short-Term**
Single-family dwellings Two-family dwellings Rectories, parsonages	No minimum	No minimum
Townhouse dwellings Multifamily dwellings	1.00 space per unit for the first 20 units in a building; 1.05 spaces per unit for additional units	0.10 space per unit on a lot (for lots with 4 or more units)
Elderly oriented congregate housing	0.50 space per unit	0.05 space per unit
Lodging houses, convents, monasteries, dormitories, fraternities, sororities	0.50 space per bed	0.05 space per bed
Hotels, motels Tourist houses	0.02 space per sleeping room	0.05 space per sleeping room

Note:

Where four or fewer long-term bicycle parking spaces are required, they may be provided in a covered outdoor location rather than an enclosed structure.

photo by Greg Raisman

HOW MUCH BICYCLE PARKING IS REQUIRED BY ZONING?

	Required Bicycle Parking (minimum spaces per 1,000 sq. ft. of floor area)	
Non-Residential Use Type	**Long-Term**	**Short-Term**
General or professional offices Arts/crafts studios	0.30	0.06
Technical offices, research labs	0.22	0.06
Banks, financial offices (ground floor)	0.30	0.50
Retail stores, consumer service	0.10	0.60
Food and convenience stores Entertainment, recreation	0.10	1.00
Restaurants, bars	0.20	1.00
Theaters, gathering halls	0.08	1.00
Industrial (manufacturing, storage) Auto repair, auto sales	0.08	0.06
Churches	0.08	0.50
Medical offices	0.30	0.50
Medical clinics	0.20	0.50
Hospitals	0.20	0.10
College or university academic or administrative facilities	0.20	0.40
College or university student activity facilities	0.20	1.00
Primary, secondary or other schools Other uses	*see zoning*	

Note:

Up to four required long-term bicycle parking spaces (or up to 20% of the required number, whichever is greater) may be provided as short-term bicycle parking spaces.

WHEN ARE YOUR REQUIRED TO PROVIDE BICYCLE PARKING?

Constructing a new building:

Unless the building is a single-family or two-family detached dwelling, bicycle parking is required. Bicycle parking is still allowed and encouraged for single-family and two-family homes.

Expanding an existing building or converting it to a new use:

The zoning provides a set of rules to determine when bicycle parking is required. Here is a simplified way to figure out if the requirements will apply; for more detail, review Section 6.100 of the Zoning Ordinance.

1. Calculate the sum of total long-term and short-term bicycle parking spaces required (under current zoning) for the
EXISTING or PRIOR USE on the site: _____

2. Calculate the sum of long-term and short-term bicycle parking spaces required (under current zoning) for the
NEW or PROPOSED USE on the site: _____

3. If the number in Calculation 2 is greater than the number in Calculation 1 by at least 15% and at least two (2) spaces, then short-term and long-term bicycle parking is required for the *entire building* (not just for the increase).

PUBLIC CONTRIBUTION FOR SHORT-TERM BICYCLE PARKING

Private developers and property owners may not install racks in the public right-of-way without formal permission from the city. If you have a lot on which short-term parking cannot be provided due to site constraints (e.g. an existing building with zero lot lines is being reused), you must get approval from the city to make a contribution towards parking on public property in lieu of on-site bicycle parking. For more information please e-mail bikerack@cambridgema.gov.

SITING BICYCLE PARKING

Bicycle parking must be designed for convenient daily use, not simply for storage of bicycles. Location is an extremely important factor in the usefulness of a bicycle rack. The rack must be located in a safe and accessible place with adequate space to maneuver a bicycle in and out.

Safe locations are:

- In full view, maximizing visibility and minimizing vandalism, near pedestrian traffic, windows, and/or well-lit areas.
- Under cover, to protect bicycles from inclement weather.
- Far enough away from the street or parking spaces so that bicycles will not be damaged by cars, setback if possible.
- Not obstructing pedestrian traffic.

photo by John Luton

Accessible locations have these characteristics:

- They are between the road/path that cyclists use and the entrance of the building.
- The primary access route is at least 5 feet wide.
- The primary access route does not have a slope greater than 5% (8% if level landing is provided every 30 feet of linear distance).
- Access may be provided by an elevator with interior dimensions of 80" x 54".
- Close to the main entrance that cyclists use for the building. For short-term parking within 25' is ideal but no more than 50' is required.

Weather-protected bicycle parking is desirable where bikes are parked for long periods.

SHORT-TERM AND LONG-TERM PARKING

Some aspects of bicycle parking are different depending on whether it will serve people who are storing bicycles all day long or overnight, or people who are making short trips to and from the site.

Long-Term:

Long-term Bicycle Parking must be located in an enclosed, limited-access area designed to protect bicycles from precipitation and from theft. It may be provided in the following types of facilities:

- Enclosed spaces in a building, such as bicycle rooms or garages.
- Bicycle sheds, covered bicycle cages, or other fully covered and enclosed structures within 200 feet of the main building entrance.
- Bicycle lockers, or fixed-in-place containers wherein single bicycles may be securely stored and protected.
- Weather-protected bicycle parking spaces that are monitored at all times by an attendant or other security system.

photo by Mark Horowitz

Short-Term:

Short-term bicycle parking must be located in a publicly accessible space within 50 feet of pedestrian entrances. Short-term bicycle parking is intended primarily to serve visitors, such as retail patrons making trips of up to a few hours; however, it may serve other bicycle users as needed.

PARKING GARAGES

Bicycle parking in parking garages must be either on the same level as the entrance to the garage from the street or accessible via automobile ramps designed to serve bicyclists (with slope of less than 5% or less than 8% with a landing every 30 feet), or near an elevator that is sufficiently large to accommodate bicycles. Bicycle racks inside parking garages must still meet the security standards of short-term racks or lockers. Where long-term bicycle parking is next to automobile parking or loading, a physical barrier, such as bollards, must be provided.

photo by Norman Cox

ACCEPTABLE BICYCLE RACKS

There are a variety of designs for bicycle racks produced by many manufacturers. Bike racks can be purchased as single units, with a capacity of locking 2 bikes (one on each side), or as multiple units attached together, with a larger capacity. However, not all manufactured bicycle racks meet Cambridge's standards.

Features of an acceptable bicycle rack:

- Installed on a permanent foundation (e.g., concrete pad) to ensure stability.
- Securely anchored into or on the foundation with tamper-proof nuts if surface mounted.
- Support for an upright bicycle by its frame horizontally in **two (2)** or more places.
- Keeps both bike wheels on the ground.
- Design that prevents the bicycle from tipping over.
- Ability to support a variety of bicycle sizes and frame shapes.
- Space to secure the frame and one or both wheels to the rack with a cable, chain, or u-lock.
- Diameter of locking pole is no more than 1.5 inches.
- Galvanized or stainless steel racks are recommended (and required for racks on public property) because they hold up best.

photo by Greg Raisman

Acceptable racks, like the "Inverted U," "Swerve," and "Post and Ring" racks, have two-point support and fit a variety of bicycle types. Custom designs and "artistic" racks can also be used, provided they meet the performance criteria for bicycle racks.

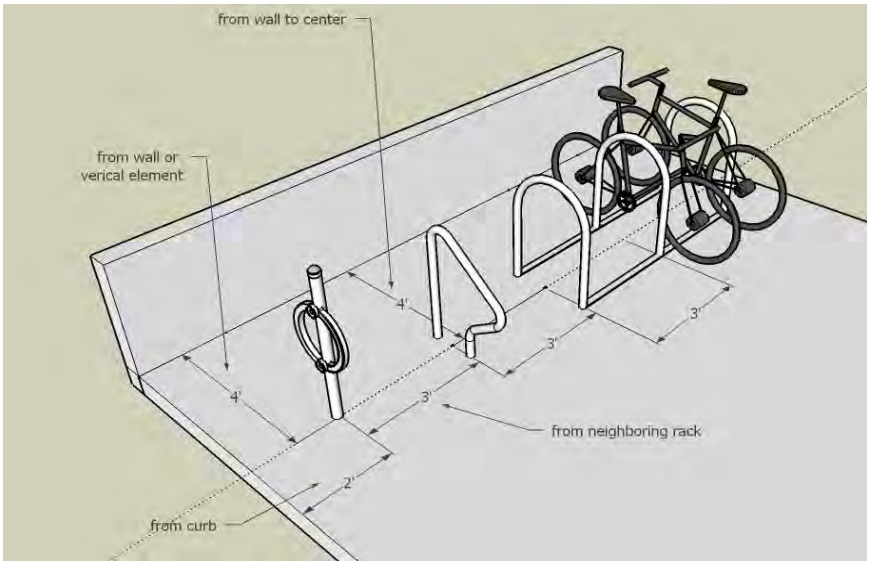
UNACCEPTABLE BICYCLE RACKS

Bicycle racks must *NOT*:

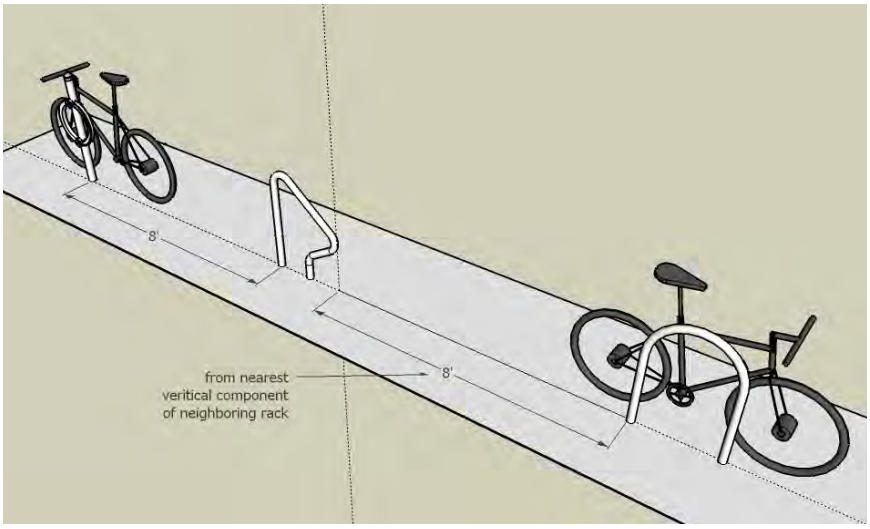
- Support the bicycle at only one point.
- Allow the bicycle to fall, which can damage the bike and block pedestrian right-of-way.
- Have sharp edges, that can be hazardous to the visually impaired.
- Support the bicycle by one wheel.
- Connect to each other with a bar on top (that can block handlebars and baskets.
- Suspend any part of the bike in the air or require that the bicycle be lifted to get it into position.

LAYOUT DIMENSIONS

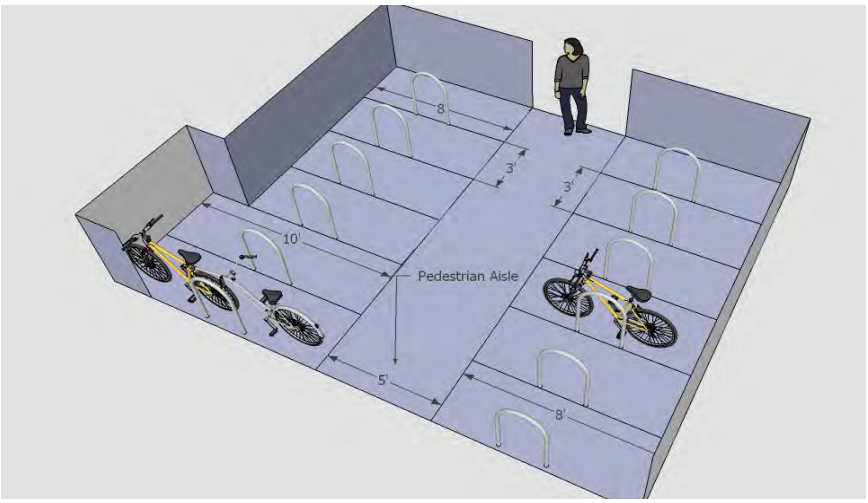
Proper layout of bicycle racks is essential to ensure that they will safely and conveniently accommodate the intended number of bicycles. Layout must follow these minimum dimensions:



Racks aligned side by side



Racks aligned end to end



Enclosed rack area with 20 or more racks, with pedestrian aisle and at least 5% of spaces providing an additional 2 feet of space for tandems and trailers.

Distance to other Racks:

- Rack units aligned parallel to each other (side by side) must be at least 3 feet apart. This includes racks that are sold as multiple rack units attached together.
- Rack units aligned end to end must be at least 8 feet apart.

Distance from Wall:

- Rack units placed perpendicular to a wall must be at least 4 feet from the wall to the center of the rack.
- Rack units parallel to a wall must be at least 3 feet from the rack to the wall.

Distance from a Curb:

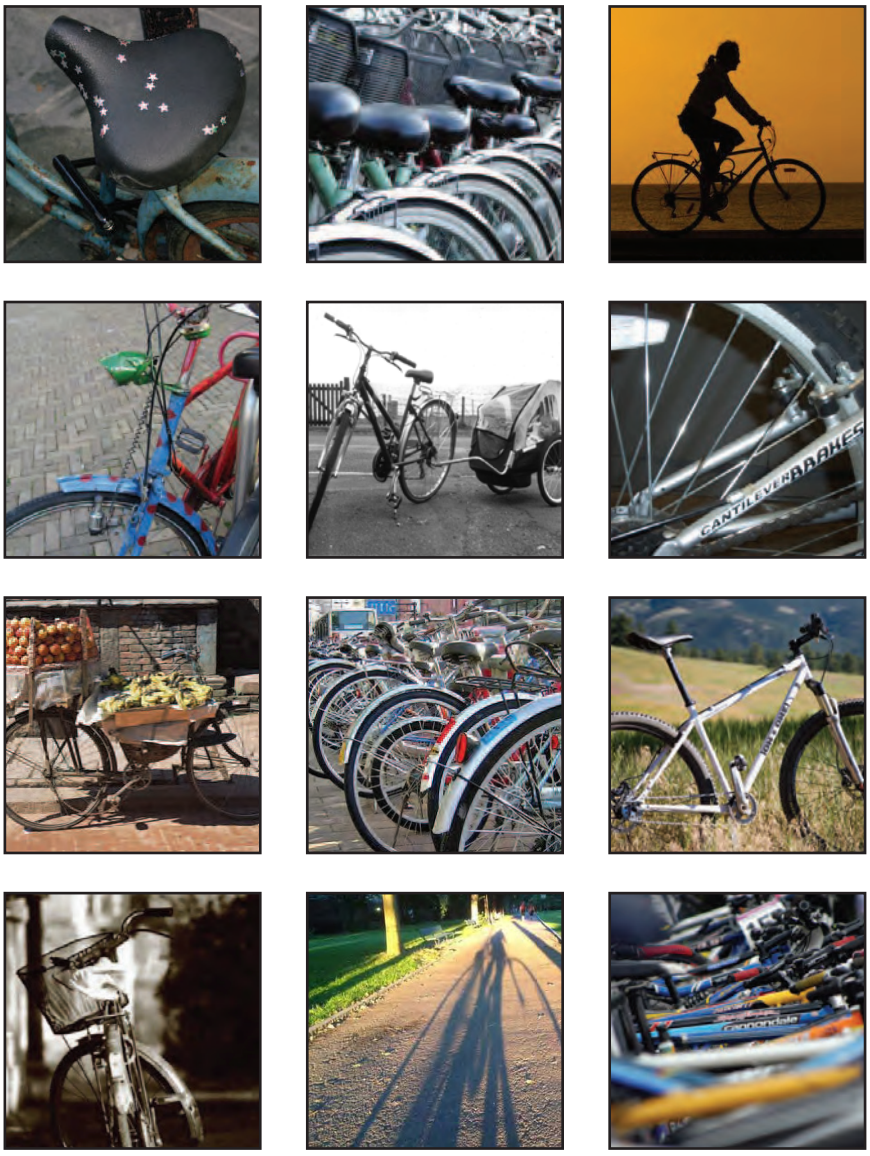
- Rack units placed perpendicular to the curb must be at least 4 feet from the curb to the center of the rack.
- Rack units placed parallel to the curb must be at least 2 feet from the curb to the rack.

Distance from a Pedestrian Aisle:

- Rack units perpendicular to a pedestrian aisle must be at least 4 feet from the center of the rack to the edge of the aisle, and have at least a 5 feet wide aisle.
- Where 20 or more bicycle parking spaces are required, at least 5% of the spaces must be 10 feet long instead of 8 feet to allow space for tandems and trailers.

Other Distances:

- Racks should be at least 14 feet from curbside fire hydrants and 6 feet from wall fire hydrants.



City of Cambridge

Community Development Department
Environmental and Transportation Planning
344 Broadway, Cambridge, MA 02139
Voice: 617 349-4600 • Fax: 617 349-4669 • TTY: 617 349-4621
Web: www.cambridgema.gov/bikeparking

Fall 2013

APPENDIX G: WIKIMAP ACTION ITEMS

cambridge bicycle network plan

WIKIMAP ACTION ITEMS

DECEMBER 2014

What are WikiMap Action Items?

As a direct result of your comments on the Spring 2014 online WikiMap, on paper maps at numerous public input sessions, through the online survey, and at the June Open House, we were able to identify a variety of suggested improvements throughout the city on which action could be taken. The table and map below identify many of your great ideas, indicating the status of investigation or implementation. Many improvements are being evaluated or planned for next year, while others have already been implemented!

ID	CATEGORY	LOCATION	STATUS	DESCRIPTION
1	Signs, Markings	Mass Ave and Cambridge St	Will Be Looked At	Signage to aid in merge coming out of tunnel from Mass Ave onto Cambridge St
2	Signs, Markings	Main St and Columbia St	Done	Bike Box on Main St at Coumbia St to facilitate turns toward Mass Ave
3	Signs, Markings	Norfolk St	Done	Add double yellow line ot Norfok St contra-flow lane
4	Signs, Markings	Waterhouse St Contra-flow	Will Be Looked At	Better signage for Waterhouse St contra-flow lane
5	Construction, Paving	Multiple	Sent to Public Works	Reported potholes and poor pavement conditions
6	Construction, Paving	Fort Washington Park	Will Be Done	Pave access path to the at-grade railroad crossing
7	Construction, Paving	Vassar St and Pacific St	Identify Funding and Who will Implement	Provide a pedestrian and bicycle crossing on Vassar St at the Pacific St railroad crossing to connect with eastbound Vassar St cycle track
8	Construction, Paving	Webster Ave and Lincoln St	Will Be Done	Remove the intersection pavers at the intersection of Webster Ave and Lincoln St
9	Signals	Trowbridge St at Harvard St	*	Add bike detection at Trowbridge St at Harvard St
10	Signals	Huron Ave and Garden St	*	Bike detection at Huron Ave and Garden St
11	Bike Parking, Fix-its	Alewife T Station	Will Be Looked At	Bicycle Fix-It Station at Alewife T
12	Bike Parking, Fix-its	Tobin School	Added to 2015 List	Bike Parking needed: Tobin School
13	Bike Parking, Fix-its	Graham and Parks	Added to 2015 List	Bike Parking needed: Graham and Parks
14	Bike Parking, Fix-its	Mass Ave and Western Ave/River St	Added to 2015 List	Bike Parking needed: Mass Ave at Western Ave/River St
15	Bike Parking, Fix-its	Broadway at Portland St	Added to 2015 List	Bike Parking needed: Broadway at Portland St
16	Bike Parking, Fix-its	Main Library	Added to 2015 List	Bike Parking needed: Main Library
17	Bike Parking, Fix-its	Galleria	Done	Bike Parking needed: Galleria
18	Bike Parking, Fix-its	Mass Ave and Cedar St	Will Be Looked At	Bike Parking needed: Mass Ave and Cedar St
19	Hubway	Multiple	Will Be Looked At	All Hubway suggestions recorded for consideration
20	Longer Term Potential	Bolton St and Walden Square Rd	Determining Public Easements	Pave an existing gravel path between Bolton St and Walden Square Rd
21	Longer Term Potential	Inman Square	Major Planning Study Underway	Several comments about signal improvements at Inman Square
22	Longer Term Potential	Ames St	Planning Stages	Remove the existing curb extensions on Ames Street to continue the cycle track to the south
23	Longer Term Potential	Mass Ave and Western Ave	Planning Stages	Intersection improvements on Mass Ave to connect bicyclists to the Western Avenue cycle track
24	Longer Term Potential	Alewife Linear Park and Mass Ave	Evaluation	Add signage and /or bike boxes at Alewife Linear Park and Mass Ave indicating how to transition from path to road
25	Longer Term Potential	Russell Field	Done by others?	Improvements to paths around and through Russell Field
26	Need More Evaluation	Linear Path at Westley Ave	Evaluation	Provide connection to Linear Path at the end of Westley Ave
27	Need More Evaluation	Alewife T Station Access Road	Evaluation	Convert wide sidewalk to cycle track and pedestrian path on Alewife T Station Access Road
28	Need More Evaluation	Linear Path, Mass Ave, Cedar St	Planning Stages	Provide direction on how bicyclist's should cross at the intersection of Linear Path/Mass Ave/Cedar Street
29	Need More Evaluation	Mass Ave and Putnam St	Evaluation	Bicyclists traveling westbound on Mass Ave would like to be able to turn left onto Putnam St
30	Need More Evaluation	Sidney St, Mass Ave, Main St	Evaluation	Allow bicyclists traveling northbound on Sidney St to cross Mass Ave onto Main St
31	Need More Evaluation	Webster Ave and Hampshire St	Evaluation	Improve visibility for turns from Webster Ave to Hampshire St
32	Need More Evaluation	Mass Ave and Somerville Ave	Evaluation	Improved signal timing at Mass Ave and Somerville Ave
33	Need More Evaluation	Galileo and Broadway	Evaluation	Bike box for left turns from Galileo (N Bound) to Broadway
34	Not Anticipated to Advance	Grove St and Huron Ave	Outside Limits**	Add intersection treatment for bicyclists turning left from Grove St to Huron Ave
35	Not Anticipated to Advance	Minuteman Path and Discovery Park Path	Outside Limits**	Add crosswalk and curb ramp from Minuteman path to Discovery Park path, It appears this part of the path may be in Arlington

*All loops are intended to function for bicycles. Reported loops will be checked for sensitivity. Some bicycles will not be detected because of their material (carbon fiber bikes, for example)
**Outside Limites = not in the City limits and/or not under City control